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Department of
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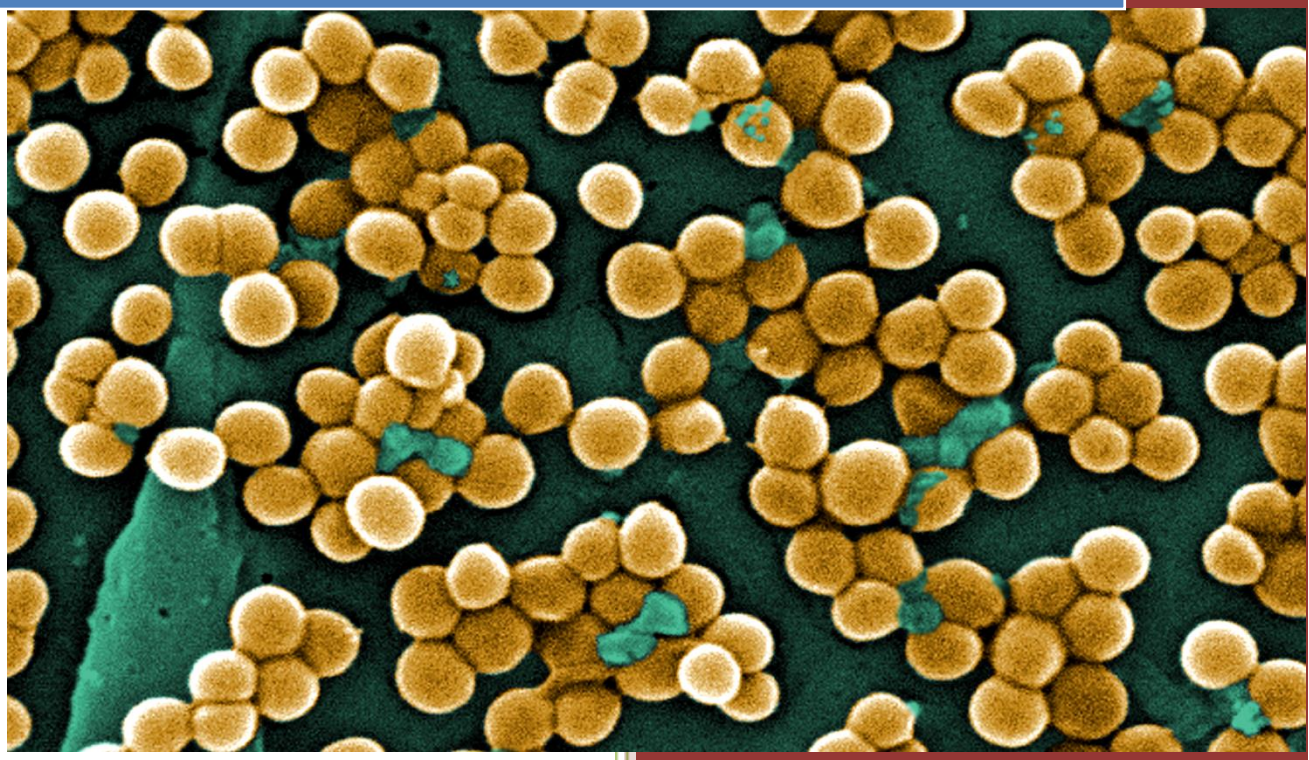
Annual Report on Health Care-Associated Infections



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Executive Summary

Health care-associated infections (HAIs) are infections that occur as a result of medical treatment at a health care facility. In the United States, an estimated 1.7 to 2 million people acquire HAIs annually, and as many as 98,000 patients die needlessly due to preventable medical harm (Institute of Medicine, 2000). In an effort to address the HAI problem and increase health care transparency in Texas, the Texas Department of State Health Services (DSHS) instituted a mandatory HAI reporting law which would provide HAI data from general hospitals and ambulatory surgery centers (ASCs) to the public and therefore, promote infection prevention activities within health care facilities and improve patient safety.

This is the first annual report on Texas HAI data from January 2012 to December 2012 regarding the following infections:

- Central Line- Associated Bloodstream Infections (CLABSI) data for any Adult, Pediatric or Neonatal Intensive Care Units (ICU) in general hospitals
- Surgical Site Infections (SSIs) and related data for the following surgical procedure categories in pediatric/children's general hospitals:
    - Spinal surgery with instrumentation (Laminectomies, Fusions, Refusions)
    - Cardiac procedures (including Heart Transplant)
    - Ventricular shunt operations
- Surgical Site Infections (SSIs) and related data for the following surgical procedure categories in adult care general hospitals and ASCs:
    - Colon surgeries
    - Hip arthroplasties
    - Knee arthroplasties
    - Abdominal hysterectomies
    - Vaginal hysterectomies
    - Coronary artery bypass grafts (with and without donor site incision)
    - Vascular procedures (abdominal aortic aneurysm repairs, carotid endarterectomies, peripheral vascular bypass grafts)

A total of 320 Texas health care facilities reported HAI data to Texas in 2012 with 996 CLABSIs and 1,075 SSIs identified.

- The overall CLABSI Standardized Infection Ratio (SIR) was 0.554 which showed that Texas had a statistically significantly better experience than the baseline national 2006-2008 data. Looking at the monthly SIR, it appears that the CLABSI SIR increased slightly from the beginning of 2012 to the end of 2012.
- The overall SSI Standardized Infection Ratio (SIR) was 0.87 which showed that Texas had a statistically significantly better experience than the baseline national 2006-2008 data. Unlike CLABSI, the monthly SSI SIRs appeared to decrease gradually from January to December 2012.

Introduction

Each year, millions of patients contract infections in health care settings, creating a tremendous burden on health care systems and public health. In 1999, the Institute of Medicine (IOM) published the report, *To Err is Human* which called for a national effort to make health care safer. The report stated that as many as 98,000 patients die needlessly due to preventable medical harm particularly, health care-associated infections (HAIs) (Institute of Medicine, 2000).

Increased public awareness and understanding that these infections can be prevented has prompted consumers and policy makers to take action. The Patient Safety and Quality Improvement Act of 2005 was passed to improve patient safety by encouraging voluntary reporting of events that adversely affect patient outcomes (Agency for Healthcare Research and Quality, 2008). Such HAI reporting legislation that requires facilities to publically disclose their HAI incidence, works to encourage facilities to implement effective infection prevention measures to reduce their HAI risk. In the years that followed, many state legislatures passed laws that mandated public reporting of HAIs: Texas was among them.

Texas health care facilities began public reporting of specific health care-associated infection (HAI) data in October, 2011. This first annual Texas Health Care Safety report summarizes the HAI reporting activities of Texas health care facilities from January 2012 through December 2012 and is based on data submitted by April 1, 2013. The information provided in this report is intended to inform patient consumers along with health care personnel and encourage health care systems to move toward the elimination of HAIs. For those readers who are unfamiliar with health care terminology, a glossary can be found in Appendix A of this report.

Background

As the United States population ages, the number of people in need of health care services will increase. Between 2000 and 2050, the percent of the population aged 85 and over is projected to increase by up to 350% (Wiener, 2002). With increased use of health care services, the risk of developing an HAI becomes greater. These infections, caused by microorganisms that a patient is exposed to while receiving medical care at a health care facility, affect approximately one in every 20 patients during their hospital stay (US Department of Health and Human Services, 2010).

HAIs are a significant cause of morbidity and mortality in the United States. According to the Centers for Disease Control and Prevention (CDC), there were an estimated 1.7 million HAIs in 2002, contributing to approximately 98,000 HAI-related deaths (Klevens RM, 2007). Each year, these infections are responsible for $28 to $33 billion dollars in avoidable health care expenses (US Department of Health and Human Services, 2010). In Texas, an estimated 200,000 HAIs occur annually, causing 8,000-9,000 deaths in the over 23 million residents (The Centers for Disease Control and Prevention, 2009). Fortunately, these infections are preventable and reduction efforts can save lives as well as avoid unnecessary medical costs.

As patient demand for health care transparency increases, more states are publically reporting health care quality information in consumer-directed reports. In an effort to increase health care transparency and accountability in Texas, the Texas Department of State Health Services (DSHS) established an advisory panel in 2005 to study and make recommendations for the collecting and reporting of HAIs. This panel was comprised of health care consumer advocates, infection preventionists, health care facility leaders, physicians and DSHS representatives. The following is a summary of the advisory panel recommendations that were adopted by DSHS.

Advisory Panel Recommendations for Reporting

Using the Centers for Disease Control and Prevention's (CDC) HAI surveillance definitions, the advisory panel recommended that licensed general hospitals (excluding comprehensive medical rehabilitation facilities), state owned or operated hospitals and ambulatory surgery centers report central line-associated primary bloodstream infections occurring in special care inpatient settings and surgical site infections associated with specific high-volume and high-risk surgical procedures. In order to accomplish this, the advisory panel recommended that Texas establish an electronic reporting system to collect HAI data and compile facility-specific HAI reports to be made available on a public web site. This would allow consumers to make informed choices about their own health care, as well as incentivize facilities to reduce their infection rates by improving patient safety and reducing health care costs.

The advisory panel recommended a phased-in approach to reporting. This would expand the types of infections reported over time as the state and its health care facilities built the infrastructure required for a robust and refined reporting system. These recommendations ensure that the best quality data are provided to the public as soon as possible.

In 2007, Texas joined the ranks of states that have created mandatory HAI reporting laws with the passing of Chapter 98 of the Texas Health and Safety Code, (Reporting of Health Care-Associated Infections and Preventable Adverse Events), and 25 Texas Administrative Code, Chapter 200 (Health Care-Associated Infections). In accordance with the advisory panel's recommendations, DSHS is required to 1) establish and implement the Texas HAI Reporting System, 2) provide education and training to stakeholders, 3) verify the accuracy and completeness of data reported, 4) compile and make available to the public a data summary by health care facility at least annually, 5) allow health care facilities to submit concise written comments regarding their HAI reports for public view and 6) enforce reporting mandates. Legislation was also amended to include preventable adverse events (PAE) reporting and required the addition of 4 health care quality improvement professionals to the advisory panel. The summary results of PAE reporting will be discussed in a separate report once PAE reporting is implemented. The advisory panel continues to guide implementation efforts in the state and meets regularly to advise DSHS regarding health care safety matters. For a full list of 2012 Advisory Panel Members, see Appendix B.

Mandated HAI Reporting Schedule

As suggested by the advisory panel, DSHS implemented a phase-in schedule for HAI reporting. In 2012, general hospitals (both pediatric and adult) were required to report central line-associated bloodstream infections (CLABSI) that occurred in their special care units. Ambulatory surgery centers (ASCs) and adult general hospitals were also required to report surgical site infections associated with knee prosthesis procedures (KPRO), hip prosthesis procedures (HPRO), and cardiac artery bypass grafts (CBGB and CBGC). Pediatric general hospitals (i.e. children's hospitals) were required to report surgical site infections associated with ventricular shunt procedures (VSHN), cardiac surgeries (CARD) and heart transplants (HTP).

Additional surgical procedures are being reported in 2013. These include vaginal hysterectomies (VHYS), abdominal hysterectomies (HYST), colon procedures (COLO), peripheral vascular bypass grafts (PVBY), carotid endarterectomies (CEA), abdominal aortic aneurysm repair (AAA), spinal fusions (FUSN), spinal refusions (RFUSN) and laminectomies (LAM). See Table 1 for the complete phase-in reporting schedule. These procedures will be included in subsequent annual reports.

Table 1. Texas HAI Reporting Schedule			
Phase	**HAI**	**Facility Type/Unit**	**Start Date**
1	CLABSI: Bloodstream infection in a patient with a central line	All General Hospital ICUs	10/1/11
	KPRO: Arthroplasty of knee	ADULT General Hospitals and ASCs	10/1/11
	VSHN: Ventricular shunt operations, including revision and removal of shunt	PEDIATRIC General Hospitals	10/1/11
2	HPRO: Arthroplasty of hip	ADULT General Hospitals and ASCs	1/1/12
	CBGB: Chest procedure to perform direct revascularization of the heart; includes obtaining vein from donor site	ADULT General Hospitals and ASCs	1/1/12
	CBGC: Chest procedure to perform direct vascularization of the heart	ADULT General Hospitals and ASCs	1/1/12
	CARD: Procedures on the heart; includes valves or septum; does not include coronary artery bypass graft, surgery on vessels, heart transplantation, or pacemaker implantation	PEDIATRIC General Hospitals	1/1/12
	HTP: Transplantation of heart	PEDIATRIC General Hospitals	1/1/12
3	VHYS: Removal of uterus through vagina; includes that by laparoscope	ADULT General Hospitals and ASCs	1/1/13
	HYST: Removal of uterus through abdominal wall; includes that by laparoscope	ADULT General Hospitals and ASCs	1/1/13
	COLO: Incision, resection, or anastomosis of the large intestine; includes large-to-small and small-to-large bowel anastomosis; not rectal operations	ADULT General Hospitals and ASCs	1/1/13
	PVBY: Bypass operations on peripheral arteries	ADULT General Hospitals and ASCs	1/1/13
	CEA: Endarterectomy on vessels of head and neck (includes carotid artery and jugular vein)	ADULT General Hospitals and ASCs	1/1/13
	AAA: Resection of abdominal aorta with anastomosis or replacement	ADULT General Hospitals and ASCs	1/1/13
	FUSN: Immobilization of spinal column	PEDIATRIC General Hospitals	1/1/13
	RFUSN: Refusion of spine	PEDIATRIC General Hospitals	1/1/13
	LAM: Exploration or decompression of spinal cord through excision or incision into vertebral structures	PEDIATRIC General Hospitals	1/1/13

Education and Training

DSHS has partnered with various professional organizations to provide wide-spread education and training to as many health care professionals in Texas as possible. Since the beginning of 2010, the DSHS Health Care Safety Program staff have presented at numerous conferences and functions for various stake-holder organizations. Most noteworthy are the local chapter meetings and conferences for the Association for Professionals in Infection Control and Epidemiology (APIC), the Texas Society of Infection Control and Prevention (TSICP), Texas Ambulatory Surgery Center Society (TASCS), Texas Medical Association (TMA), Texas Association for Healthcare Quality (TAHQ), and Texas Medical Foundation Health Quality Institute (TMF).

DSHS has also sponsored twenty-two, one-day long HAI reporting training sessions in collaboration with APIC. These sessions took place between January 2011 and August 2012 in 15 different cities in Texas and were led by Infection Preventionists with at least five years of experience using the designated electronic interface and familiarity with entering the applicable HAI data. Trainers provided detailed information about Texas reporting requirements, facility enrollment, protocols and surveillance definitions and provided adequate time for audience questions and discussion. Training manuals were provided at no cost to the over 1,200 health care facility personnel who attended the trainings.

Prevention Collaboratives

In addition to the education and training mentioned above, DSHS also initiated significant collaborations with the Texas Hospital Association Foundation (THAF) and University of Texas Health Science Center (UTHSC) to reduce CLABSI and SSI rates in Texas. Table 2 (below) shows a summary of the Texas sponsored prevention collaboratives. These collaborations represent the cornerstones for future HAI program development and implementation.

Table 2. HAI Prevention Collaboratives

Organization	Term	Purpose
Texas Hospital Association Foundation (THAF)	10/15/10 - 12/31/11	Twenty-one acute care hospitals were enrolled in the collaborative (including eight rural hospitals). Of these, thirteen hospitals were involved in a central line-associated bloodstream infection (CLABSI) reduction initiative and eight hospitals participated in a surgical site infection (SSI) reduction initiative.
University of Texas Health Science Center (UTHSC)	10/15/11 - 07/31/12	Nine health care facilities were enrolled in this collaborative to reduce central line-associated bloodstream infections (CLABSIs) and surgical site infections (SSIs) associated with knee and hip arthroplasties.

Table 2. HAI/PAE Prevention Collaboratives (cont.)		
Organization	**Term**	**Purpose**
Texas Hospital Association Foundation (THAF)	5/1/12 - 7/31/12	Evidence-based HAI prevention collaborative complimenting THAF's larger Partnership for Patients effort involving Texas acute care hospitals to reduce central line-associated bloodstream infections (CLABSIs) and surgical site infections (SSIs) associated with knee and hip arthroplasties, and/or cardiac artery bypass graft surgeries.
Texas Hospital Association Foundation (THAF)	8/1/12 - 7/31/13	Continuation of previous collaborative to reduce central line-associated bloodstream infections (CLABSIs) and surgical site infections (SSIs) associated with knee and hip arthroplasties, cardiac artery bypass graft surgeries.

Methods

This report contains self-reported HAI data from 320 Texas health care facilities and contains information about infections that occurred from January 2012 through December 2012. These data were downloaded from NHSN on April 1st, 2013 and therefore any changes or updates to the data after this date will not be reflected in this report.

National Healthcare Safety Network (NHSN)

In order to collect large amounts of data from health care facilities and implement Texas HAI reporting, a database management system with a secure electronic interface was required. The most widely used HAI reporting database is the National Healthcare Safety Network (NHSN), maintained by the Division of Healthcare Quality Promotion (DHQP) at the CDC. NHSN is a voluntary, secure, internet-based surveillance system that integrates patient safety and health care worker safety surveillance and has been utilized extensively by many states for HAI reporting. As of December 2012, 30 states and the District of Columbia used NHSN for mandatory HAI reporting (Malapiedi PJ, 2013), and as of September, 2012 a total of 10,834 health care facilities were enrolled in NHSN (The Centers for Disease Control and Prevention, 2012). These enrolled health care facilities include acute care hospitals, long-term acute care hospitals, psychiatric hospitals, rehabilitation hospitals, outpatient dialysis centers, ambulatory surgery centers, and long term care facilities.

NHSN is designed to be able to accommodate the routine transfer of large amounts of health care data from the thousands of facilities reporting into the system. In order to assist in this process, many software vendors have developed compatible software systems for uploading the large facility data files into NHSN. This is especially helpful for large facilities that perform a high volume of surgeries on a regular basis.

Another important feature of the NHSN reporting system is that participating facilities are required to use standardized CDC definitions for identifying HAIs. These definitions have been in place since 2008 for CLABSI and SSIand continue to be revised as HAI understanding increases (The Centers for Disease Control and Prevention, 2012). These standardized definitions enable facilities' HAI experience to be comparable to health care facilities, nationally. To aid in the use of these standardized definitions, CDC provides extensive online training and educational materials that facilities can use to educate themselves on the use of surveillance protocols and data entry.

In 2011, NHSN was designated as the web-based electronic reporting system for Texas HAI reporting. In addition to state reporting, the Center for Medicare and Medicaid Services (CMS) also requires hospitals in the Hospital Inpatient Quality Reporting Program to report to NHSN all CLABSIs in adult, pediatric and neonatal ICUs and SSIs related to colon surgeries and abdominal hysterectomies in order to receive full reimbursement for services. These data are also

posted for public reporting on the Department of Health and Human Services (DHHS) Hospital Compare website (Centers for Medicare and Medicaid Services, 2012). However, it is important to note that the CMS NHSN data reports will differ from Texas NHSN data reports. This is due to differences in reporting requirements, data submission deadlines, and how the standardized infection ratio (SIR) is calculated.

Data Quality Assurance

It is the responsibility of each facility to ensure data have been accurately collected and reported in accordance with NHSN protocols. However, to aid facilities, NHSN and DSHS have instituted routine data checks to identify data quality issues that require facility attention. Between the DSHS notifications and the internal logic checks built into NHSN, health care facilities are given several opportunities to review and correct data inconsistencies prior to publication of their data summaries.

NHSN

Within the NHSN system there are internal data logic checks and rules built into the web interface that help reduce the occurrence of common data entry error. These checks are designed to reduce keystroke errors and provide a mechanism for assuring the validity of data entered into NHSN. For example, the following are some of the logic checks NHSN performs on date data entered into the system:

- Date procedure was performed must be the same date or before the date the patient's infection occurred
- Date procedure was performed must be the same date or after the patient's date of birth
- Patient's date of birth must be the same date or after 01/01/1890 and the same date or before the current date
- Patient's date of birth must be the same date or before the date the patient's infection occurred
- Patient's date of birth must be the same date or before the date the patient was admitted to the hospital
- Date the patient's infection occurred must be the same date or after the date the patient was admitted to the hospital

Another data accuracy tool built into the reporting system is the NHSN Action List. This list contains various data error alerts that are displayed upon logging into NHSN. This list shows users whether a facility has any missing or incomplete records entered into NHSN and requires user action in order to resolve these data issues. See Appendix C: Missing/Incomplete Alerts list for a detailed description of these NHSN data quality alerts.

DSHS

Along with the NHSN data checks, DSHS also performs several checks for data consistency. Every quarter, DSHS provides facilities with a facility-specific Facility Error Report showing the number of SSI, CLABSI and Procedure records that were downloaded from NHSN for a given reporting time period. Facilities can then compare the DSHS HAI record numbers to their internal HAI record numbers to determine if all records were entered into NHSN. In addition, DSHS also creates reports to identify facilities with data quality issues. Some of these issues include incomplete records, and inconsistent reporting plans. When this occurs, facility contacts are notified and follow-up is provided to ensure facilities are aware of their data errors and given the opportunity to verify and correct their data prior to data publication.

DSHS has also piloted a data verification process to review HAIs reported from facilities with significantly high SIRs. These facilities were identified for each half year (i.e. January – June 2012 and July – December 2012) and a DSHS staff member performed a site visit to review the reported HAIs and surveillance practices. This process was used to identify false positives and to determine if there were any areas for improvement in the infection prevention practices of the facility. If areas for improvement were identified or the facility was found to have significantly high SIRs in the following round of data verification, the HAI Epidemiologists were consulted to review appropriate infection prevention practices with the facilities, as needed. For more information regarding this process, please review the Audit Protocol described in Appendix D.

HAI data quality was also assessed by comparing the surgical procedure data reported to NHSN to the number of surgical procedures found in the facility's discharge data. The latest discharge data public use files (2011) were obtained from the Centers for Health Statistics' Texas Health Care Information Collection (THCIC). Facilities with a high level of discrepancy between what was reported for 2011 and those that were reported into NHSN for 2012 were contacted and asked to explain the cause for the discrepancy. Generally, the discrepancy was due to normal fluctuations in the volume of surgical procedures that were performed by the facility. However, a few facilities did identify a systematic NHSN data entry error and corrective action was taken to avoid such data entry errors in the future. All facilities responded appropriately to the request for information.

Contact Management System (TxHSN)

Data downloaded from NHSN are uploaded into the Texas Health Care Safety Network (TxHSN) where HAI data are saved and used to populate the published facility specific HAI data display reports. In addition to being a data warehouse, the TxHSN system is also designed to keep track of health care facilities' reporting status and contact information. Annually, letters are sent to all Texas HAI reporting-eligible health care facilities (i.e. general hospitals and ASCs) requesting them to inform DSHS of any changes in their reporting status or whether they are still

required to report. Changes in reporting status may occur due to the opening/closing of ICUs or changes to surgical services provided. Facilities are also given an opportunity to submit contact information for up to two staff members who will be contacted by DSHS for questions or notifications regarding HAI reporting. Designated facility contacts are responsible for maintaining communications with DSHS and updating any facility or contact changes.

Reporting Schedule and Data Deadlines

NHSN data downloads occur 8 times per year—twice a quarter—and follow a strict timeline. The reporting timeline breaks town each calendar year into 4 reporting time periods: the first quarter of the year (January through March) or Q1, the first half of the year (January through June) or H1, the third quarter (July through September) or Q3, and the second half of the year (July through December) or H2 (see Table 3).

In order to aid facilities in the reporting process, TxHSN has an email notification system that enables DSHS staff to send and track emails to the facilities' designated contacts. This enables DSHS to send reporting deadline reminders to facility contacts throughout the year and helps synchronize the reporting schedule. For each of the reporting time periods, facility contacts are notified and given an opportunity to check and correct data in NHSN.

In accordance with NHSN Rules of Behavior, facilities must enter their HAI data into NHSN within 30 days of the end of the reporting month. For example, facilities must enter all April data by the end of May. DSHS will download a preliminary set of NHSN data approximately 60 days after the end of the calendar quarter to perform Data Reconciliation. The dates for the first data download of the reporting time period are June 1, Sept 1, December 1 and March 1. Preliminary data are reviewed and compiled in facility-specific reports called Facility Errors Reports which include record counts for SSIs, CLABSIs and Procedures. Fifteen days after the DSHS Data Reconciliation, the facility contacts receive an email notification from TxHSN. This email informs contacts that their Facility Errors Report is ready to be reviewed in TxHSN and they should review their NHSN Action Items list. They will have 15 days to correct any errors before the final data pull occurs. The second and final data pull for the reporting time period is scheduled for July 1, October 1, January 1 and April 1. After this date, the data for the given time period cannot be changed. This ends the reporting process for Q1 and Q3 reporting time periods.

However, twice a year—for each half year—DSHS creates facility-specific HAI Data Display Reports that are published on the public website. When this happens, 15 days after the second and final data pull of the reporting time period, TxHSN facility users receive a second email to notify them that their Data Display Reports are ready to preview in TxHSN.

After facility contacts review the reports in TxHSN, they may wish to further explain what their data mean and may do so by submitting a comment in TxHSN. They will have 15 days to review the report and submit a public comment for review by DSHS. Once submitted, DSHS program staff can either approve or not approve the submitted comment. Approved comments are appended to the facility's HAI data display reports that are posted in December (for H1 data) and June (H2 data of the previous year). Comments may not be approved for any of the following reasons:

- Inappropriate language
- Refers to another health care facility
- Refers to another reporting time period
- Comment is submitted after the deadline for comments has passed
- Comment does not appear to be meant for display on the public report

Those comments that are not approved by DSHS are indicated as such in TxHSN and the facility may resubmit a second comment for review if the comment deadline has not passed. All approved comments will be displayed on the facility's Data Display reports for the public to view.

Each facility will have two final facility-specific HAI Data Display Reports generated for each half year. One version of the report is a brief, simple report that shows the Standardized Infection Ratio (SIR) and a statistical interpretation. This report is meant to be viewed by the general public who may not be familiar with basic statistics. For those who are more familiar with statistical processes, there is a detailed version that will also be published. This detailed report shows the numerator (the number of infections), the denominator (for CLABSI, central line days; for SSI, number of surgical procedures performed), the expected/predicted number of infections (based on national rates), along with the SIR and statistical interpretation (Appendix E).

Table 3. Texas HAI Reporting Deadlines				
Reporting Quarter	**Q1: Jan 1 – Mar 31**	**H1: Jan 1 – June 30**	**Q3: July 1 – Sept 30**	**H2: July 1 – Dec 31**
Data submission deadline (data entry into NHSN)	**According to NHSN rules: ~within 30 days of end of reporting month**			
Departmental data reconciliation (Data from NHSN –emails facility contacts ~15th)	1-Jun	1-Sep	1-Dec	1-Mar
Facility data corrections due (in NHSN)	30-Jun	30-Sep	31-Dec	31-Mar
DSHS data summary to facilities (DSHS sends email to contacts)	NA	15-Oct	NA	15-Apr
Facility comment period (Facility enters comments into TxHSN)	NA	30-Oct	NA	30-Apr
DSHS review of comments	NA	15-Nov	NA	15-May
Public posting of summary (with approved comments)	NA	1-Dec	NA	1-Jun

Facility HAI Data Display Reports Website

Once comments are approved, Facility-Specific HAI Data Display Reports are published on a public website that can be accessed at www.haitexas.org. From here, there is a link to the HAI Data where consumers can search for HAI data by facility name, county or city and run facility-specific HAI reports.

Standardized Infection Ratio (SIR) Calculation

In the past, HAI data have been presented using infection incidence rates. This rate was calculated as the number of HAIs divided by the appropriate denominator. For CLABSIs, the denominator was central line days and for SSIs the denominator was the total number of surgical procedures performed. However, these rates did not take into consideration the differences between health care settings and therefore, made it difficult to accurately compare facilities' HAI experience.

On the other hand, the standardized infection ratio (SIR) can be used as a standardization method for summarizing HAI experience across any number of health care facilities or unit types. It can assess HAIs at a national, state, or local level and adjusts for patients of varying risk within each facility. Because of this, the SIR has become the new standard for comparing

HAI incidence since 2009 (The Centers for Disease Control and Prevention, 2012). Simply put, the SIR compares the facility's actual HAI incidence to the baseline national HAI data—obtained from January 2006 through December 2008—and adjusts for several risk factors that are significantly associated with differences in infection incidence (Edwards J, 2009).

Having risk adjusted data means that different health care facilities can be accurately compared by adjusting for differences in severity of illness and other factors that may affect HAI risk. For example, one would expect a health care facility that performs complex procedures on very sick patients to have a higher infection rate than a hospital that performs less complex surgeries on healthier patients. Because of this, it is important to adjust for the number and proportion of high and low risk patients before comparing the infection rates of these facilities. The HAIs presented in this report are all risk adjusted and use the SIR as the standard of measurement. However, it is important to note that the methods of risk adjustment differ between the two types of infection described in this report: CLABSIs and SSIs.

Central Line Associated Bloodstream Infections (CLABSIs)

For adult and pediatric ICU patients, CLABSI risk adjustment uses the type of patient care location, bed size of the patient care location and hospital affiliation with a medical school to determine the patient's risk for acquiring a CLABSI (Malapiedi PJ, 2013). However, additional criteria may be used in certain settings. For example, the patient's birth weight is also used for risk adjustment in neonatal intensive care units (NICUs). A complete list of NHSN patient care locations including location descriptions can be found on the NHSN website at: http://www.cdc.gov/nhsn/PDFs/pscManual/15LocationsDescriptions_current.pdf.

To illustrate the way the CLABSI SIR is calculated and to show how it can be used as an HAI comparison metric, the following example data are displayed below:

	Observed Hospital CLABSI		National CLABSI
Location Type	**#CLABSI**	**#Central line-days**	**CLABSI rate***
Neurosurgical ICU	1	712	2.0
**defined as the number of CLABSIs per 1000 central line-days*			

This SIR is calculated by dividing the total number of observed CLABSI events by a "predicted" number of CLABSI events based on the national CLABSI rates. This "predicted" number is calculated by multiplying the National CLABSI rate with the number of central line days that occurred in the hospital unit and divide by 1000 (remember that the CLABSI rate is per

1000 central line days). The formula for calculating the expected or predicted number of CLABSI for this unit is:

$$\frac{\textbf{(Observed central line days) * (National rate)}}{\textbf{1000}} = \frac{\textbf{(712) * (2.0)}}{\textbf{1000}} = \textbf{1.42}$$

1.42 is the number of expected/predicted CLABSIs for this location at this hospital.

Therefore the SIR calculation is:

$$\textbf{SIR} = \frac{\textbf{(Observed \# CLABSIs)}}{\textbf{(Expected \# CLABSIs)}} = \frac{\textbf{1}}{\textbf{1.42}} = \textbf{0.70}$$

If the SIR is larger than 1, it means the health care facility reported more HAIs than expected based on the national benchmark and therefore, is doing worse than the national experience. If the SIR is less than 1, it means the health care facility reported fewer HAIs than expected and therefore, is doing better than the national experience. If the SIR is equal to 1, then the facility reported the same number of HAIs as expected and is doing about as well as the national experience. For the example shown above, a SIR of 0.70 means that the facility had 30% fewer CLABSIs than what was expected and is therefore, 30% better than the national experience.

Although a SIR may indicate a facility is doing better or worse than the national experience, the statistical significance of that difference is important to note. Confidence intervals and p-values are used to determine this statistical significance. It determines whether the SIR is a result of chance or if it indicates a true distinction from the national experience. A SIR that has a confidence interval (CI) that contains 1.0 or a p-value that is ≥ 0.05 should be interpreted as indicating there is no difference from the national HAI experience, regardless of whether the SIR is greater to or less than 1. Many times, a CI or p-value that does not indicate significance is due to not enough data available for a given time period.

Surgical Site Infections (SSIs)

The SSI SIR is calculated in a different way. For patients undergoing surgery, risk adjustment is calculated using logistic regression models. In 2012, the NHSN baseline data from 2006 – 2008 were used to determine the risk factors and the weight of each risk factor. The logistic regression model looks at several different risk factors that are specific to each type of surgical procedure. Each risk factor's contribution to the overall infection risk varies, depending on its effect. For example, risk factors for cardiac surgery include patient's age, the American Society of Anesthesiologists (ASA) score and the duration of the procedure. The risk factors for knee prosthesis procedures include the same as those for cardiac surgeries, but they are weighted differently. Knee prosthesis procedures also include additional risk factors such as the patient's

gender, whether the procedure was a revision, and the number of hospital beds, among others. Risk factors for the different procedure categories are shown in Appendix F.

The risk of each individual surgery is then added up for each procedure category and is used to determine the expected or predicted number of SSIs. The SIR is the number of observed SSIs divided by the number of expected SSIs. For a more detailed explanation of the SIR calculation, please see the National Healthcare Safety Network (NHSN) October 2010 newsletter at http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf.

Eligible Data

This report presents HAI surveillance data for calendar year 2012 that was reported to NHSN from eligible general hospitals and ambulatory surgery centers across Texas. These data were downloaded from NHSN on April 1st, 2013.

Due to unavailable national baseline data, SIRs are not provided in this report for ASCs and Long Term Acute Care (LTAC). Secondary SSIs, or those infections that did not develop in the primary incision site of the surgical procedure are not included in the SIR calculation. In addition, months with some missing or incomplete data are also excluded from the SIR calculation.

Results

The HAIs described in these analyses were identified using the January 2012 NHSN surveillance definitions and were collected on April 1st, 2013 for the time period of January 1st, 2012 through December 31st, 2012. Please note that these data are self-reported from each health care facility and have not been formally validated by DSHS apart from the data review processes described previously.

Facility Summary Tables

Only 368 of the 885 eligible general hospitals and ASCs were required to report HAIs to Texas in 2012. The others did not have ICUs nor did they perform any of the Texas reportable procedures; therefore, did not have anything to report.

Of the 368 health care facilities that were required to report, 320 reported HAI data to Texas (via NHSN) in 2012. A summary of these health care facilities is shown in Table 4. Those facilities that did not report were referred to DSHS Regulatory Department for follow-up.

Table 4. Facility Type Summary

Facility Type	N	Percent of Facility Type Reporting HAI
General Hospital	262	82%
Surgical Hospital	32	10%
Ambulatory Surgery Center	1	<1%
Critical Access Hospital	9	3%
Children's Hospital	10	3%
Orthopedic Hospital	3	1%
Long Term Acute Care Hospital	1	<1%
Oncology Hospital	1	<1%
Women's Hospital	1	<1%
All Facilities	**320**	100%

The majority of Texas health care facilities reporting HAI data to Texas in 2012 were general hospitals, making up 82% of the facilities that reported HAI data to DSHS. Note that there was only one ambulatory surgery center that reported HAI data in 2012.

Tables 5 – 7 summarize the characteristics of the 320 health facilities that reported HAI data to Texas. Table 5 shows the minimum and maximum total number of hospital beds that were set up and staffed in the 319 hospitals (the ASC does not have staffed beds), as well as the mean number of beds for each facility type. The number of Texas hospital beds that were set up and staffed in 2012 ranged from 4 in a surgical hospital to 1,034 in a general hospital, with a mean bed size of 183.4.

Table 5. Hospital Bed Summary Table

Hospital Type	Min # Beds	Max # Beds	Mean # Beds
General Hospital	9	1034	205.7
Surgical Hospital	4	230	34.1
Critical Access Hospital	21	25	24.6
Children's Hospital	30	459	196.6
Long Term Acute Care Hospital	158	158	158
Orthopedic Hospital	6	31	18.5
Oncology Hospital	607	607	607
Women's Hospital	397	397	397
All Hospitals	**4**	**1034**	**183.4**

Table 6 lists facilities (both hospitals and ASCs) with and without medical school affiliation. This table shows that there were 56 (18%) facilities that were affiliated with a medical school and 258 (81%) that did not have medical school affiliation.

Table 6. Facility Frequency by Medical School Affiliation

Medical School Affiliation	No. Hospitals	Percent of Total
Medical School Affiliation	**56**	**18%**
Undergraduate	24	8%
Major	24	8%
Graduate	8	2%
No Medical School Affiliation	**258**	**81%**
*****Missing*****	**6**	**2%**

Table 7 summarizes the type of facility ownership. There were slightly more not-for-profit health care facilities than there were for profit facilities. Only 10% were physician owned and 6% were government run (this excludes veteran's hospitals and other federal government-run health care facilities).

Table 7. Facility Frequency by Hospital Ownership		
Facility Ownership	**No. Hospitals**	**Percent of Total**
Not for Profit	134	42%
For Profit	130	41%
Physician Owned	33	10%
Government	19	6%
Missing	4	1%

Table 8 displays a breakdown of the number of ICUs reporting CLABSI by hospital type and ICU type. Because general hospitals accounted for 82% of the facilities that reported HAI in Texas, it is not surprising that a majority of the ICUs that reported CLABSI were from general hospitals. Also, of the 515 ICUs that reported CLABSI, almost half (208) were defined as Medical/Surgical ICUs.

Table 8. Number of Hospitals Reporting CLABSI by ICU Type

Hospital Type	Burn	Cardiac	Surgical Cardio-thoracic	Medical	Med/Surg	Neurologic	Neurosurgical	Surgical	Trauma	Pedi Cardio-thoracic	Pedi Medical	Pedi Med/Surg	NICU (level II/III)	NICU (level III)	LTAC
Critical Access Hospital					5										
Children's Hospital	1									2		9	6	3	
General Hospital	4	22	25	42	200	2	15	30	7	1	1	16	66	45	
Long-Term Acute Care															2
Oncology Hospital				1				1				1			
Surgical Hospital			1		2			1					1	1	
Women's Hospital					1								1		
All Hospitals	**5**	**22**	**26**	**43**	**208**	**2**	**15**	**32**	**7**	**3**	**1**	**26**	**74**	**49**	**2**

Table 9 shows the number of facilities reporting SSIs by type of health care facility and surgical procedure category. As expected, a majority of the facilities that reported SSI data were general hospitals. Of the non-children's hospitals, HPRO and KPRO were reported more than CBGB or CBGC procedures. For pediatric hospitals, only 2 reported performing heart transplants. The one ASC reported HAI data for KPROs.

Table 9. Number of Facilities Reporting SSI by Procedure Category							
Facility Type	**CARD**	**CBGB**	**CBGC**	**HPRO**	**HTP**	**KPRO**	**VSHN**
Ambulatory Surgery Center						1	
Critical Access Hospital				6		6	
Children's Hospital	7				2		7
General Hospital		132	97	227		230	
Oncology Hospital				1		1	
Orthopedic Hospital				3		3	
Surgical Hospital		3	2	26		30	
All Facilities	**7**	**135**	**99**	**263**	**2**	**271**	**7**

Texas Pathogen Summary Tables

Antibiograms are tables that show the overall profile of an organism's antibiotic susceptibility. They can be used to monitor trends in resistance and aid clinicians in selecting empiric antimicrobial therapies in a given geographical area.

Using the HAI pathogen data submitted to NHSN for 2012, Texas has developed a series of antibiograms to help evaluate trends in antibiotic susceptibility and resistance across the state.

Table 10 and Table 11 show the 2012 Overall Texas HAI Antibiogram for gram-positive organisms and gram-negative organisms, respectively. These antibiograms contain data about the SSI and CLABSI pathogens reported to NHSN for 2012. The antibiotics are grouped by drug class. Please note that the percent shown in each cell represents the percent susceptible. Also, organisms with less than 10 isolates reported were excluded from these tables, as were antibiotics that had less than 25 isolates.

Regional antibiograms for the state of Texas are also provided in Appendix G of this report. The following map shows the 11 different regions in Texas. These regions are referred to as Health Service Regions (HSRs). HSRs 2/3, 4/5N, 6/5S and 9/10 are usually grouped together in analyses and are therefore grouped as such in the tables shown in Appendix G.

Table 12 shows the 2012 Overall Texas Antibiogram for SSIs. This is an aggregate of all pathogens identified for SSIs of the reportable surgical procedure categories.

Table 13 shows a summary of the SSI pathogens by procedure category. The percent represents the percent of isolates of the total number of isolates for a procedure category. From this table we can see that gram-positive organisms cause the majority of SSIs that were reported. Note that HTPs are not listed here because there were no HTP SSIs reported in 2012.

Table 14 shows the 2012 Overall Texas Antibiogram for CLABSIs. This antibiogram compiles CLABSI pathogen data from all ICU locations.

Table 15 shows a summary of the CLABSI pathogens by ICU type. The percent frequency of pathogens for each unit type is displayed along with the overall CLABSI counts and percentages shown in the All Units column. Overall, there were more gram-positive CLABSI pathogens than there were gram-negatives. However, the Burn and Trauma ICUs had a much higher proportion of gram-negative pathogens than the other ICU locations. The adult cardiac and pediatric cardio-thoracic ICUs also had more gram-negative CLABSIs than gram-positive CLABSIs, but the difference was not as great. There also seems to be a higher percentage of fungal infections identified in CLABSIs (15.5%) when compared to SSIs (< 1 %).

Table 10. Overall Texas HAI Antibiogram – Gram-Positive Organisms, 2012

	aminoglycosides			β-lactam/β-lactamase inhibitor		cephalosporins			quinolones			penicillins			macrolide	folate inhibitor	lincosamide	lipopeptide	oxazolidone	ansamycin	tetracycline	glyclycycline	glycopeptide
Pathogen Name	**Gentamicin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Cefazolin**	**Cefoxitin**	**Ceftriaxone**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Ampicillin**	**Oxacillin/ Methicillin**	**Penicillin G**	**Erythromycin**	**Trimethoprim/ Sulfamethoxazole**	**Clindamycin**	**Daptomycin**	**Linezolid**	**Rifampin**	**Tetracycline**	**Tigecycline**	**Vancomycin**
Gram-Positive																							
Enterococcus faecium		(31) **87%**	(19) **47%**						(10) **0%**			(50) **14%**			(17) **18%**	(11) **91%**		(15) **100%**	(44) **100%**		(14) **36%**		(57) **23%**
Enterococcus faecalis		(111) **66%**	(97) **73%**						(43) **60%**	(47) **64%**		(149) **95%**		(18) **100%**				(44) **100%**	(80) **98%**		(66) **24%**	(13) **85%**	(154) **94%**
Enterococcus spp.		(22) **73%**	(18) **67%**									(29) **76%**							(15) **100%**		(11) **27%**		(33) **73%**
Staphylococcus aureus	(417) **95%**			(22) **77%**	(18) **78%**	(18) **83%**	(79) **57%**	(13) **62%**	(199) **59%**	(303) **61%**	(136) **69%**	(14) **7%**	(609) **55%**	(39) **3%**	(562) **45%**	(507) **97%**		(138) **100%**	(296) **100%**	(375) **99%**	(486) **94%**	(84) **95%**	(555) **100%**
Staphylococcus epidermidis	(39) **49%**				(10) **0%**				(17) **29%**	(31) **35%**	(10) **70%**		(49) **12%**	(11) **0%**	(50) **20%**	(24) **42%**	(545) **67%**		(23) **100%**	(35) **97%**	(33) **73%**		(223) **99%**
Staphylococcus coagulase negative (CNS)													(10) **30%**	(10) **0%**	(10) **20%**								(89) **97%**
Staphylococcus hominis																							(16) **94%**

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

Table 11. Overall Texas HAI Antibiogram – Gram-Negative Organisms, 2012

	aminoglycosides			b-lactam/b-lactamase inhibitors			cephalosporins							quinolones				carbapenems			penicillins		macrolide	folate inhibitor	lincosamide	tetracycline	glyclycycline
Pathogen Name	**Amikacin**	**Gentamicin**	**Tobramycin**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin/ Tazobactam**	**Ceftazidime**	**Cefazolin**	**Cefepime**	**Cefotaxime**	**Cefoxitin**	**Ceftriaxone**	**Cefuroxime**	**Cefotetan**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Ampicillin**	**Piperacillin**	**Azithromycin**	**Trimethoprim/ Sulfamethoxazole**	**Clindamycin**	**Tetracycline**	**Tigecycline**
Gram-Negative																											
Acinetobacter baumannii	(12) **42%**	(24) **50%**	(19) **47%**	(18) **50%**			(17) **47%**		(22) **45%**						(19) **53%**	(11) **45%**			(11) **36%**					(19) **53%**		(10) **70%**	
Escherichia coli	(78) **97%**	(112) **81%**	(89) **80%**	(76) **54%**	(42) **67%**	(86) **93%**	(68) **88%**	(93) **71%**	(90) **86%**	(49) **88%**	(59) **86%**	(97) **87%**	(41) **78%**	(16) **88%**	(92) **70%**	(79) **67%**	(23) **70%**	(40) **98%**	(62) **100%**	(56) **100%**	(108) **33%**		(51) **82%**	(97) **63%**		(39) **56%**	(10) **100%**
Enterobacter aerogenes	(13) **92%**	(22) **100%**	(20) **100%**			(18) **78%**	(15) **80%**	(12) **17%**	(19) **100%**	(10) **60%**		(18) **67%**			(17) **100%**	(16) **100%**		(10) **100%**	(12) **100%**	(10) **100%**	(10) **0%**			(20) **100%**			
Enterobacter cloacae	(43) **93%**	(73) **95%**	(54) **98%**	(32) **16%**	(24) **8%**	(52) **81%**	(38) **74%**	(50) **18%**	(61) **95%**	(34) **62%**	(28) **14%**	(62) **68%**	(31) **13%**		(57) **96%**	(46) **98%**	(12) **100%**	(24) **96%**	(36) **97%**	(45) **100%**	(39) **5%**		(30) **70%**	(58) **88%**		(30) **93%**	
Klebsiella oxytoca	(16) **100%**	(28) **96%**	(24) **96%**	(20) **70%**		(19) **89%**	(13) **92%**	(15) **67%**	(17) **82%**	(16) **81%**	(16) **88%**	(22) **86%**	(10) **70%**		(19) **89%**	(17) **94%**		(10) **100%**	(11) **100%**	(17) **100%**	(24) **0%**			(24) **96%**			
Klebsiella pneumoniae	(74) **96%**	(127) **94%**	(96) **88%**	(80) **73%**	(43) **74%**	(78) **85%**	(62) **76%**	(107) **78%**	(88) **82%**	(49) **84%**	(53) **89%**	(102) **82%**	(47) **66%**	(20) **90%**	(99) **88%**	(85) **84%**	(23) **91%**	(45) **96%**	(60) **97%**	(77) **96%**	(121) **7%**		(47) **77%**	(102) **84%**		(42) **60%**	(11) **91%**
Pseudomonas aeruginosa	(94) **95%**	(125) **83%**	(117) **86%**			(103) **89%**	(102) **82%**	(17) **94%**	(114) **88%**			(14) **0%**			(118) **75%**	(90) **73%**			(80) **80%**	(75) **80%**		(38) **89%**	(56) **70%**				
Serratia marcescens	(26) **100%**	(47) **100%**	(37) **92%**	(27) **4%**		(37) **86%**	(30) **83%**	(34) **15%**	(35) **97%**	(26) **85%**	(13) **23%**	(40) **93%**	(20) **10%**		(39) **97%**	(34) **100%**			(21) **95%**	(19) **100%**	(31) **10%**		(17) **82%**	(36) **94%**	(45) **36%**	(13) **0%**	
Proteus mirabilis	(13) **100%**	(19) **100%**	(15) **100%**	(10) **90%**					(16) **94%**		(10) **100%**	(15) **100%**			(13) **92%**	(15) **93%**		(10) **100%**			(22) **86%**			(14) **93%**			

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

Table 12. Texas SSI Antibiogram, 2012

	aminoglycosides					b-lactam/b-lactamase inhibitors			cephalosporins								quinolones		carbapenems			macrolides		penicillins			lincosamide	lipopeptide	oxazolidone	anzamycin	tetracycline	glyclycycline	glycopeptide
Pathogen Name	**Amikacin**	**Gentamicin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Tobramycin**	**Ampicillin/Sulbactam**	**Amoxicillin/Clavulanic Acid**	**Piperacillin/Tazobactam**	**Cefazolin**	**Cefepime**	**Cefotaxime**	**Cefoxitin**	**Ceftazidime**	**Ceftriaxone**	**Cefuroxime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Azithromycin**	**Erythromycin**	**Ampicillin**	**Oxacillin/Methicillin**	**Penicillin G**	**Clindamycin**	**Daptomycin**	**Linezolid**	**Rifampin**	**Tetracycline**	**Tigecycline**	**Vancomycin**
Gram-positive																																
Enterococcus faecium	(26) **100%**									(29) **100%**	(19) **84%**	(22) **95%**	(25) **92%**			(23) **74%**								(10) **20%**					(10) **100%**				(62) **92%**
Enterococcus faecalis	(59) **97%**		(39) **59%**	(35) **66%**						(32) **88%**	(12) **75%**	(10) **100%**	(68) **84%**				(20) **70%**							(58) **95%**		(10) **100%**		(19) **100%**	(33) **97%**		(28) **25%**		(17) **82%**
Enterococcus spp.	(11) **100%**									(72) **92%**		(68) **54%**	(17) **76%**											(16) **88%**									
Staphylococcus aureus		(322) **95%**				(19) **74%**	(17) **76%**		(18) **22%**					(11) **55%**		(163) **61%**	(249) **61%**	(107) **72%**						(443)	(13) **8%**	(484)	(28) **4%**	(429) **69%**	(105) **100%**	(233) **100%**	(288) **99%**	(387) **93%**	(75) **96%**	(81) **99%**
Staphylococcus epidermidis		(18) **56%**																					(21) **24%**		(21) **14%**		(20) **45%**			(11) **100%**	(10) **70%**		
Staphylococcus coagulase negative																																(38) **92%**
Gram-negative																																
Enterobacter aerogenes		(11) **100%**												(10) **80%**																		
Escherichia coli	(40) **95%**	(52) **87%**			(45) **84%**	(42) **60%**	(16) **75%**	(43) **93%**	(43) **70%**	(10) **100%**	(23) **91%**	(31) **84%**	(37) **89%**	(46) **87%**	(22) **64%**	(44) **68%**	(43) **67%**		(21) **95%**	(35) **100%**	(23) **100%**	(24) **92%**		(51) **37%**							(19) **63%**		
Enterobacter cloacae	(17) **100%**	(33) **100%**			(25) **100%**	(16) **19%**	(12) **8%**	(19) **84%**	(21) **19%**	(45) **87%**	(14) **71%**	(11) **18%**	(17) **88%**	(27) **81%**	(10) **20%**	(26) **100%**	(22) **100%**		(10) **100%**	(15) **100%**	(21) **100%**	(12) **75%**		(17) **6%**							(12) **100%**		(13) **38%**
Klebsiella pneumoniae	(13) **100%**	(47) **98%**			(36) **92%**	(27) **89%**	(19) **84%**	(25) **92%**	(37) **84%**	(14) **100%**				(38) **87%**	(15) **80%**	(37) **97%**	(29) **97%**	(12) **100%**	(19) **95%**	(19) **100%**	(28) **96%**	(18) **72%**		(43) **7%**							(15) **53%**		
Pseudomonas aeruginosa		(78) **91%**			(73) **93%**			(63) **92%**	(15) **93%**	(19) **95%**				(11) **0%**		(71) **79%**	(59) **75%**			(52) **88%**	(47) **87%**	(38) **74%**											
Proteus mirabilis		(17) **100%**			(14) **100%**				(17) **82%**					(14) **100**		(11) **91%**	(13) **92%**							(18) **89%**									(440) **100%**
Serratia marcescens		(25) **100%**			(17) **94%**	(13) **8%**		(17) **82%**						(22) **86%**		(22) **100%**	(20) **100%**			(13) **92%**	(11) **100%**			(15) **13%**									

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

Table 13. SSI Pathogen Frequency and Percent of Total Isolates by Procedure Category														
Pathogen Name	**CARD**		**CBGB**		**CBGC**		**HPRO**		**KPRO**		**VSHN**		**All SSIs**	
	N	**% of CARD**	**N**	**% of CBGB**	**N**	**% of CBGC**	**N**	**% of HPRO**	**N**	**% of KPRO**	**N**	**% of VSHN**	**N**	**% of All SSIs**
Staphylococcus aureus	8	66.7%	95	28.7%	5	29.4%	187	42.5%	178	44.1%	10	32.3%	483	39.1%
Pseudomonas aeruginosa			31	9.4%	4	23.5%	35	8.0%	16	4.0%	1	3.2%	87	7.0%
Staphylococcus epidermidis			20	6.0%	2	11.8%	26	5.9%	34	8.4%	3	9.7%	85	6.9%
Enterococcus faecalis			7	2.1%	1	5.9%	24	5.5%	32	7.9%		0.0%	64	5.2%
Staphylococcus coagulase negative			20	6.0%	3	17.6%	16	3.6%	18	4.5%	3	9.7%	60	4.9%
Other Gram-Positive	1	8.3%	28	8.5%	1	5.9%	58	13.2%	68	16.8%	2	6.5%	158	12.8%
All Gram-Positives	**9**	**75%**	**201**	**60.7%**	**16**	**94.1%**	**346**	**78.6%**	**346**	**85.6%**	**19**	**61.3%**	**937**	**75.9%**
Escherichia coli			19	5.7%			26	5.9%	10	2.5%	2	6.5%	57	4.6%
Klebsiella pneumoniae			22	6.6%			13	3.0%	9	2.2%	3	9.7%	47	3.8%
Proteus mirabilis	1	8.3%	14	4.2%			14	3.2%	9	2.2%	3	9.7%	41	3.3%
Enterobacter cloacae	1	8.3%	10	3.0%			13	3.0%	9	2.2%	1	3.2%	34	2.8%
Serratia marcescens			15	4.5%			4	0.9%	5	1.2%	2	6.5%	26	2.1%
Other Gram-Negative	1	8.3%	41	12.4%	1	5.9%	20	4.5%	16	4.0%	1	3.2%	80	6.5%
All Gram-Negatives	**3**	**25%**	**121**	**36.6%**	**1**	**5.9%**	**90**	**20.5%**	**58**	**14.4%**	**12**	**38.7%**	**285**	**23.1%**
Fungi			6	1.8%			3	0.7%					9	0.7%
Mycobacterium			3	0.9%			1	0.2%					4	0.3%

Table 14. Texas CLABSI Antibiogram, 2012

	aminoglycosides					b-lactam/b-lactamase inhibitors			cephalosporins							quinolones			carbapenems			penicillins		macrolides		folate inhibitor	lincosamide	lipopeptide	oxazolidone	ansamycin	tetracycline	glycopeptide
Pathogen Name	**Amikacin**	**Gentamicin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Tobramycin**	**Ampicillin/Sulbactam**	**Amoxicillin/Clavulanic Acid**	**Piperacillin/ Tazobactam**	**Cefazolin**	**Cefepime**	**Cefotaxime**	**Cefoxitin**	**Ceftazidime**	**Ceftriaxone**	**Cefuroxime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Ampicillin**	**Oxacillin/Methicillin**	**Azithromycin**	**Erythromycin**	**Trimethoprim/ Sulfamethoxazole**	**Clindamycin**	**Daptomycin**	**Linezolid**	**Rifampin**	**Tetracycline**	**Vancomycin**
Gram-Positive																																
Enterococcus faecium		(11) **91%**	(25) **92%**	(16) **50%**																		(40) **13%**						(12) **100%**	(34) **100%**			(44) **18%**
Enterococcus faecalis			(72) **69%**	(62) **77%**												(20) **45%**	(27) **59%**					(91) **95%**						(25) **100%**	(47) **98%**		(38) 24%	(92) **95%**
Enterococcus spp.			(13) **77%**	(13) **62%**																		(13) **62%**										(16) **63%**
Staphylococcus aureus		(95) **95%**										(11) **73%**				(36) **50%**	(54) **63%**	(29) **59%**					(125) **53%**		(119) **42%**	(111) **95%**	(116) **58%**	(33) **100%**	(63) **100%**	(87) **99%**	(99) **96%**	(115) **100%**
Staphylococcus epidermidis		(21) **43%**														(12) **25%**	(22) **36%**						(28) **11%**			(17) **47%**	(25) **28%**		(17) **100%**	(24) **96%**	(23) **74%**	(142) **99%**
Staphylococcus coagulase negative																																(51) **100%**
Staphylococcus hominis																																(13) **92%**
Gram-Negative																																
Acinetobacter baumannii		(16) **56%**			(12) **50%**	(10) **50%**				(15) **47%**			(11) **55%**			(13) **54%**										(13) **46%**						
Escherichia coli	(38) **100%**	(60) **77%**			(44) **75%**	(34) **47%**	(26) **62%**	(43) **93%**	(50) **72%**	(45) **84%**	(26) **85%**	(28) **89%**	(31) **87%**	(51) **86%**	(19) **95%**	(48) **71%**	(36) **67%**	(16) **75%**	(19) **100%**	(27) **100%**	(33) **100%**	(57) **30%**		(27) **74%**		(51) **61%**					(20) **50%**	
Enterobacter aerogenes		(11) **100%**			(11) **100%**			(10) **90%**																		(11) **100%**						
Enterobacter cloacae	(26) **88%**	(40) **90%**			(29) **97%**	(16) **13%**	(12) **8%**	(33) **79%**	(29) **17%**	(32) **91%**	(20) **55%**	(17) **12%**	(21) **62%**	(35) **57%**	(21) **10%**	(31) **94%**	(24) **96%**		(14) **93%**	(21) **95%**	(24) **100%**	(22) **5%**		(18) **67%**		(33) **85%**					(18) **89%**	
Klebsiella oxytoca	(10) **100%**	(19) **95%**			(17) **94%**	(12) **58%**		(14) **86%**		(10) **70%**				(13) **77%**		(13) **85%**					(13) **100%**	(17) **0%**				(16) **94%**						
Klebsiella pneumoniae	(48) **94%**	(80) **91%**			(60) **85%**	(53) **64%**	(24) **67%**	(53) **81%**	(70) **74%**	(56) **79%**	(30) **83%**	(31) **84%**	(37) **65%**	(64) **80%**	(32) **59%**	(62) **82%**	(56) **77%**	(11) **82%**	(26) **96%**	(41) **95%**	(49) **96%**	(78) **6%**		(29) **79%**		(64) **81%**					(27) **63%**	
Pseudomonas aeruginosa	(35) **91%**	(47) **70%**			(44) **75%**			(40) **85%**		(42) **81%**			(34) **79%**			(47) **68%**	(31) **71%**			(28) **64%**	(28) **68%**			(18) **61%**								
Serratia marcescens	(13) **100%**	(22) **100%**			(20) **90%**	(14) **0%**		(20) **90%**	(16) **6%**	(16) **100%**	(14) **93%**		(13) **92%**	(18) **100%**	(12) **0%**	(17) **94%**	(14) **100%**					(16) **6%**		(10) **90%**		(19) **95%**						

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

Table 15. CLABSI Pathogen Frequency and Percent of Total Isolates by Intensive Care Unit Type

Pathogen Name	Burn		Cardiac		Medical		Surgical		Med/ Surg		Surgical Cardio-thoracic		Neuro-surgical		Trauma		Pediatric Cardio-thoracic		Pediatric Med/ Surg		NICUs (level II/III, & III)		All Units	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
S. epidermidis			3	8.6%	13	9.4%	6	8.7%	46	11.6%	6	10.0%	3	12%	3	9.4%	1	3.7%	15	20.3%	48	20.0%	144	13.0%
S. aureus	1	10%	2	5.7%	13	9.4%	8	11.6%	32	8.1%	5	8.3%	2	8%	3	9.4%	5	18.5%	7	9.5%	49	20.4%	127	11.5%
E. faecalis			1	2.9%	17	12.3%	4	5.8%	40	10.1%	7	11.7%	1	4%	2	6.3%	2	7.4%	8	10.8%	18	7.5%	101	9.1%
E. faecium					8	5.8%	6	8.7%	21	5.3%	4	6.7%	3	12%	1	3.1%			1	1.4%			44	4.0%
CNS			5	14.3%	5	3.6%	4	5.8%	22	5.6%	2	3.3%			2	6.3%	1	3.7%	3	4.1%	15	6.3%	59	5.3%
Other Gram-Pos					14	10.1%	3	4.3%	34	8.6%	3	5.0%	4	16%	1	3.1%	2	7.4%	5	6.8%	24	10.0%	90	8.1%
All Gram-Positives	**1**	**10%**	**11**	**31.4%**	**70**	**50.7%**	**31**	**44.9%**	**195**	**49.2%**	**27**	**45.0%**	**13**	**52%**	**12**	**37.5%**	**11**	**40.7%**	**39**	**52.7%**	**154**	**64.2%**	**565**	**51.0%**
K. pneumoniae	2	20%	3	8.6%	10	7.2%	5	7.2%	27	6.8%	3	5.0%	5	20%	5	15.6%	2	7.4%	6	8.1%	14	5.8%	83	7.5%
P. aeruginosa	1	10%	3	8.6%	5	3.6%	2	2.9%	20	5.1%	6	10.0%	1	4%	2	6.3%	2	7.4%	4	5.4%	3	1.3%	49	4.4%
E. coli			2	5.7%	7	5.1%	3	4.3%	20	5.1%	2	3.3%	1	4%	1	3.1%			3	4.1%	24	10.0%	63	5.7%
E. cloacae	1	10%	2	5.7%	4	2.9%	3	4.3%	12	3.0%	2	3.3%	2	8%	6	18.8%			4	5.4%	6	2.5%	42	3.8%
Other Gram-Neg	3	30%	6	17.1%	12	8.7%	11	15.9%	40	10.1%	12	20.0%			6	18.8%	10	37.0%	10	13.5%	24	10.0%	134	12.1%
All Gram-Negatives	**7**	**70%**	**16**	**45.7%**	**38**	**27.5%**	**24**	**34.8%**	**119**	**30.1%**	**25**	**41.7%**	**9**	**36%**	**20**	**62.5%**	**14**	**51.9%**	**27**	**36.5%**	**71**	**29.6%**	**371**	**33.5%**
All Fungi	2	20%	8	22.9%	30	21.7%	14	20.3%	82	20.7%	8	13.3%	3	12%			2	7.4%	8	10.8%	15	6.3%	172	15.5%

CLABSI SIR Summary Tables

State-wide metrics summarizing the HAI experience across Texas are displayed in Table 16. The overall CLABSI SIR uses data from all ICU patient care locations including ICUs and NICUs.

Texas ICUs reported 905,251 central line days and 996 CLABSIs in 2012 compared to the 1,798.8 CLABSIs that were predicted based on the national experience. The resulting overall Texas CLABSI SIR for ICUs was calculated at 0.554 (p-value = 0; 95% CI 0.520 – 0.589) and was statistically significant. This indicates that the Texas ICU CLABSI experience is approximately 45% lower than the referent national experience.

Table 16 shows the CLABSI SIR data by ICU unit type, broken down by age group (adult, pediatric and neonatal). All three groupings showed statistically significantly lower SIRs which indicate a better CLABSI experience, the lowest SIR was found in adult ICUs (SIR = 0.534), followed by pediatric ICUs (SIR = 0.577) and then NICUs (SIR = 0.645).

Table 16. Overall Texas CLABSI SIR by Unit Age Group

Unit Type	Central Line Days	# CLABSIs	Predicted # Infections	SIR	SIR p-value	95% Confidence Interval
Texas	**905,251**	**996**	**1,798.80**	**0.554**	**0**	**0.520 - 0.589**
Adult ICUs	705,724	693	1,298.70	0.534	0	0.495 - 0.575
Pediatric ICUs (≤ 18)	50,682	90	155.92	0.577	0	0.464 - 0.710
Neonatal ICUs (infants and newborns)	148,845	213	344.25	0.619	0	0.538 - 0.708

Facility specific CLABSI SIRs were calculated for 181 hospitals. Although 268 hospitals reported CLABSI data for 2012, not all of them had enough data for NHSN to calculate a SIR. The CLABSI SIR distribution is shown in Graph 1, below.

Only 28 facilities had SIRs that were greater than 1 and only 4 (2% of facilities with calculated CLABSI SIRs) of them were statistically significant, indicating a worse CLABSI experience than the national referent population. There were 153 facilities with a SIR of less than one, 63 (35% of facilities with calculated CLABSI SIRs) were statistically significant, indicating a better experience than that experienced nationally. The rest had an experience that was similar to that of the referent population.

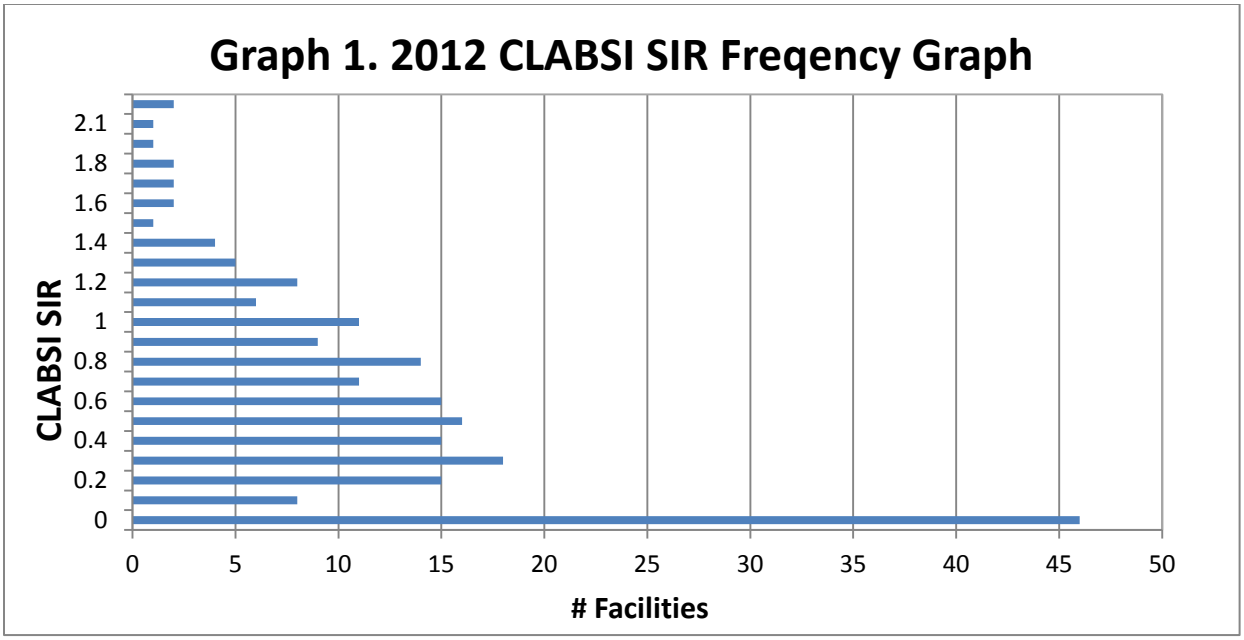


Table 17 shows the CLABSI SIR by ICU type. The Pediatric Medical ICU did not have a SIR calculated because the predicted number of infections was less than 1. All other units showed a statistically significantly better experience than the national referent population. The adult Neurological (SIR = 0.318), Neurosurgical (SIR = 0.341) and Burn ICUs (SIR = 0.393) had the lowest SIRs, while the Level III NICU (SIR = 0.681), Surgical Cardiothoracic (SIR = 0.63) and Pediatric Medical/Surgical ICUs (SIR = 0.584) had the highest CLABSI SIRs.

Table 17. Overall Texas CLABSI SIR by ICU Type

Critical Care Unit Type	Central Line Days	# CLABSIs	Predicted # Infections	SIR	SIR p-value	95% Confidence Interval
Burn	4,624	10	25.43	0.393	0.0004	0.189 - 0.723
Medical/Surgical	389,895	355	615.35	0.577	0	0.518 - 0.640
Medical	98,938	121	209.61	0.577	0	0.479 - 0.690
Cardiac	34,879	32	69.76	0.459	0	0.314 - 0.648
Neurological	4,496	2	6.29	0.318	0.0501	0.038 - 1.148
Neurosurgical	25,840	22	64.60	0.341	0	0.213 - 0.516
Surgical Cardiothoracic	64,600	57	90.44	0.63	0.0001	0.477 - 0.817
Surgical	61,262	63	140.90	0.447	0	0.344 - 0.572
Trauma	21,190	31	76.28	0.406	0	0.276 - 0.577
Pediatric Cardiothoracic	13,472	25	44.46	0.562	0.0011	0.364 - 0.830
Pediatric Medical	101	0	0.13	.	.	
Pediatric Medical/Surgical	37,109	65	111.33	0.584	0	0.451 - 0.744
NICU (Level II/III)	75,785	96	172.38	0.557	0	0.451 - 0.680
NICU (Level III)	73,060	117	171.87	0.681	0	0.563 - 0.816

Table 18 shows the 2012 CLABSI SIR by Health Service Region. All of the regions' SIRs indicate that they were significantly better than the national experience with the exception of HSR 11. In HSR 11, the SIR, p-value (not significant) and 95% confidence interval (not significant) indicate that the CLABSI experience in HSR 11 is about the same as that of the national referent population. HSR 2/3 had the lowest SIR of 0.46, followed by region 8 (SIR = 0.536) and region 6/5S (SIR = 0.537).

Table 18. Overall Texas CLABSI SIR by Health Service Region

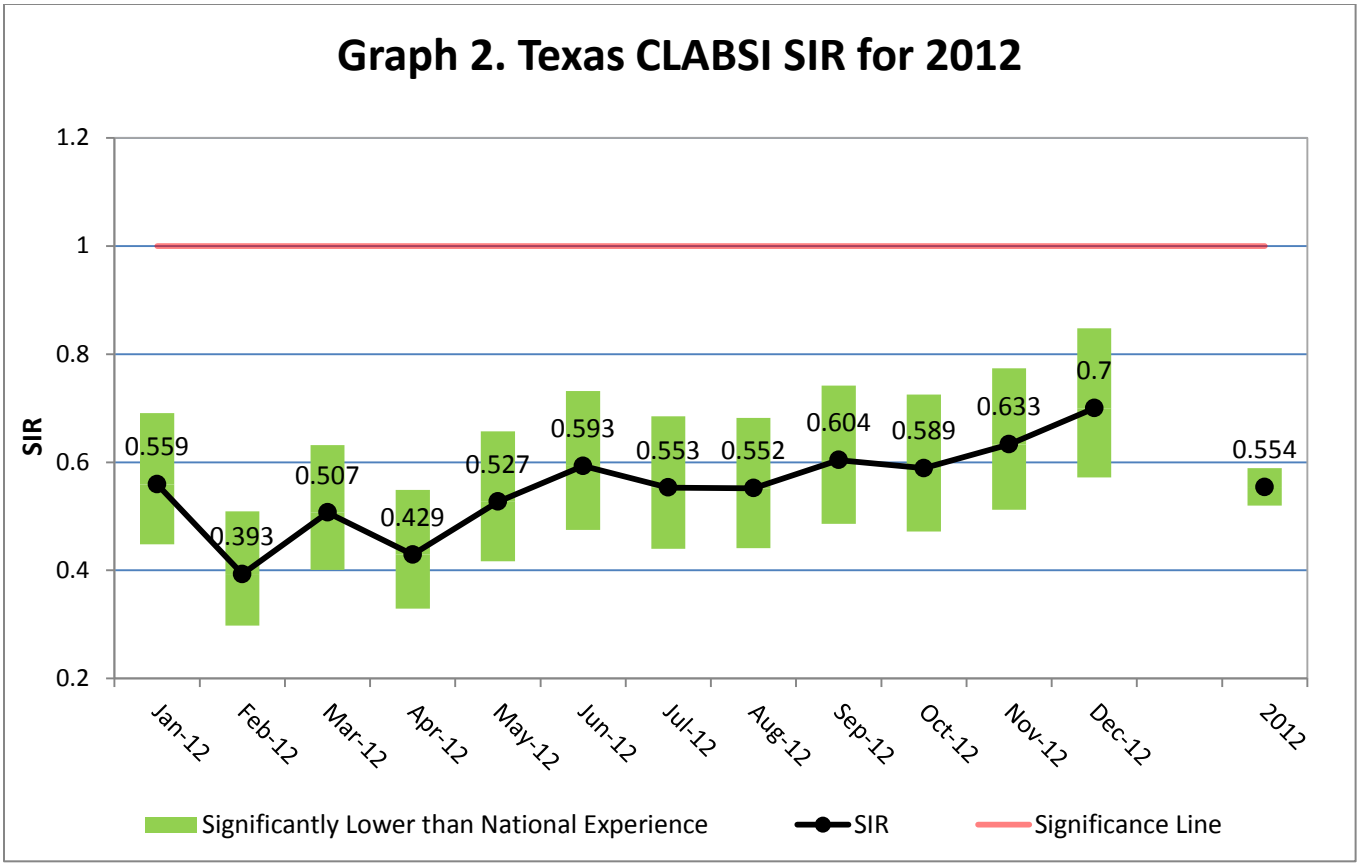
Health Service Region	Central Line Days	# CLABSIs	Predicted # Infections	SIR	SIR p-value	95% Confidence Interval
HSR 1	41,119	49	88.89	0.551	0	0.408 - 0.729
HSR 2/3	275,593	256	556.69	0.46	0	0.405 - 0.520
HSR 4/5N	34,371	44	59.60	0.738	0.0214	0.536 - 0.991
HSR 6/5S	277,632	302	562.81	0.537	0	0.478 - 0.601
HSR 7	76,924	81	144.43	0.561	0	0.445 - 0.697
HSR 8	94,192	99	184.54	0.536	0	0.436 - 0.653
HSR 9/10	36,094	44	70.01	0.628	0.0006	0.457 - 0.844
HSR 11	69,325	121	131.86	0.918	0.1841	0.761 - 1.096

In addition to these spatial analyses, DSHS also compiled overall monthly SIR data in order to identify temporal trends. Graph 2 shows the overall Texas CLABSI SIR by month. Here we can see that the CLABSI SIR for all months is significantly better than the national experience.

Each month is represented by a vertical bar that specifies the 95% confidence interval and a black circle which indicates the SIR value for that month. The overall CLABSI SIR for all of 2012 is shown on the far right.

A red line is drawn horizontally at 1.0 and is used to indicate whether the SIR is significant or not. If the vertical bar crosses the red line, it will be grey and means the SIR is not significant. If the vertical bar is completely above the red significance line then the bar will be colored red to show that the SIR is significantly higher/worse than the national experience. The bar is green when it is completely below the red significance line, showing that the SIR value is significantly lower and indicates it is better than the national experience.

The graph below (Graph 2) shows that for each month in 2012, the SIR was significantly lower/better than the national experience. However, the graph also shows that the CLABSI SIRs slowly trended upwards over the course of the year. And as noted previously, the overall 2012 CLABSI SIR was 0.554 and was statistically significant.



SSI SIR Summary Tables

In 2012, Texas health care facilities reported 85,804 surgical procedures and 1,075 SSIs compared to the 1,235.04 SSIs that were predicted to occur during that time frame. The overall Texas SSI SIR was calculated at 0.87 (p-value = 0; 95% CI 0.818 – 0.925) and was statistically significant. Therefore, the Texas SSI experience was approximately 13% lower than the national experience.

Table 19 shows the overall state SSI SIR and the SIRs by procedure category. Generally, all procedures showed a significantly better experience than the national experience, except for CBGC and HPRO that did not show a significant difference from the national referent population.

The lowest SIRs were found in the procedures solely reported by pediatric facilities. The lowest SIR being in CARD procedures (SIR = 0.524), followed by VSHNs (SIR = 0.648).

Table 19. Texas SSI SIR by Procedure Category						
Procedure Type	**Procedure Count**	**# of SSIs**	**Predicted # Infections**	**SIR**	**SIR p-value**	**95% Confidence Interval**
Texas	**85,804**	**1,075**	**1,235.04**	**0.87**	**0**	**0.818 - 0.925**
CARD	1,212	14	26.71	0.524	0.0053	0.287 - 0.879
CBGB	14,265	236	304.50	0.775	0	0.677 - 0.883
CBGC	1,311	21	29.14	0.721	0.0731	0.441 - 1.110
HPRO	24,607	398	390.19	1.02	0.353	0.920 - 1.128
HTP	26	0	0.858	-	-	-
KPRO	43,307	377	438.88	0.859	0.0014	0.773 - 0.952
VSHN	1,076	29	44.75	0.648	0.0081	0.430 - 0.937

There were 288 facilities that reported SSI data in 2012. However, 75 of these did not have SSI SIRs calculated due to low volume of procedures performed. Graph 3 shows the frequency of SIR values for the 213 facilities with a calculated SIR.

A majority of the facilities had SIRs that indicated the same or better SSI experience. There were 81 facilities that had an SSI SIR that was greater than one and of those 16 (7.5% of facilities with calculated SSI SIRs) had SIRs that were significantly higher than 1. These facilities had worse SSI experiences than the national referent population. Of the 153 facilities with a SIR less than 1, 25 (11.7% of facilities with calculated SSI SIRs) were statistically significantly lower, indicating that they had better SSI experiences than that experienced by the national referent population. There were 33 facilities that did not report any SSIs for 2012 and were given an SSI SIR of 0.

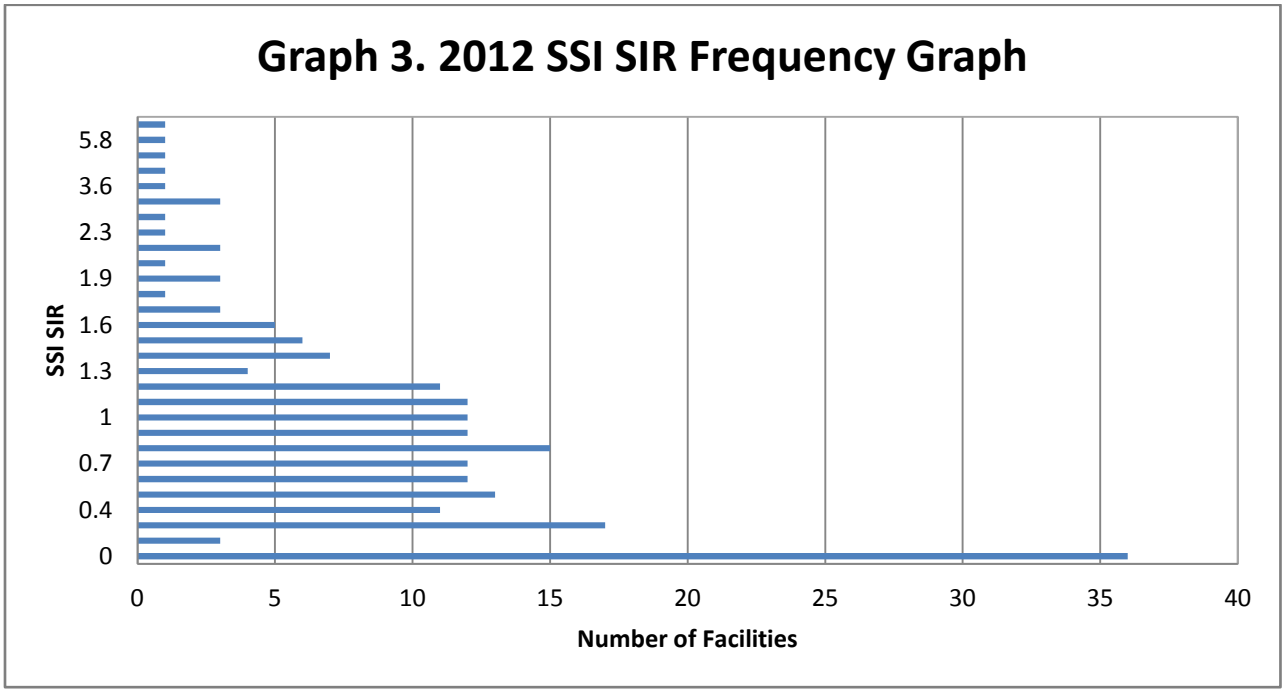


Table 20 shows the reported SSI severity by how the SSI was detected. A majority (71.5%) of the SSIs of all severity levels were identified during a patient readmission to the facility where the operation was performed. There was a higher proportion of SSIs identified in this detection category for deep and organ/space infections than for superficial infections.

The table also shows that almost half (44%) of the SSIs reported were deep incisional primary SSIs, followed by superficial incisional primary (31.2%) and then organ/space SSIs (25%).

Table 20. SSI Severity by When Detected

SSI Severity	A	P	RF	RO	Total
Superficial Primary	14.8%	18.9%	59.8%	6.5%	**31%**
Deep Primary	6.5%	7.4%	77.8%	8.2%	**44%**
Organ/Space	8.1%	8.5%	75.2%	8.1%	**25%**
Total	**9.5%**	**11.3%**	**71.5%**	**7.7%**	

A: SSI was identified before the patient was discharged from the facility following the operation.
P: SSI was identified only as part of post-discharge surveillance.
RF: SSI was identified due to patient readmission to the facility where the operation was performed.
RO: SSI was identified due to readmission to facility other than where the operation was performed.

Table 21 shows the SSI SIR for 2012 by Health Service Region. Health Service Regions 1, 2/3, 6/5S, 9/10 and 11 show SIRs that indicate a significantly better SSI experience when compared to the national experience. Region 4/5N had a similar SSI experience as the national experience/benchmark. Regions 7 and 8 had a significantly worse SSI experience than that experienced nationally, with 26.7% and 29.4% more SSIs than predicted, respectively.

Table 21. Overall Surgical Site Infection SIR by Health Service Region

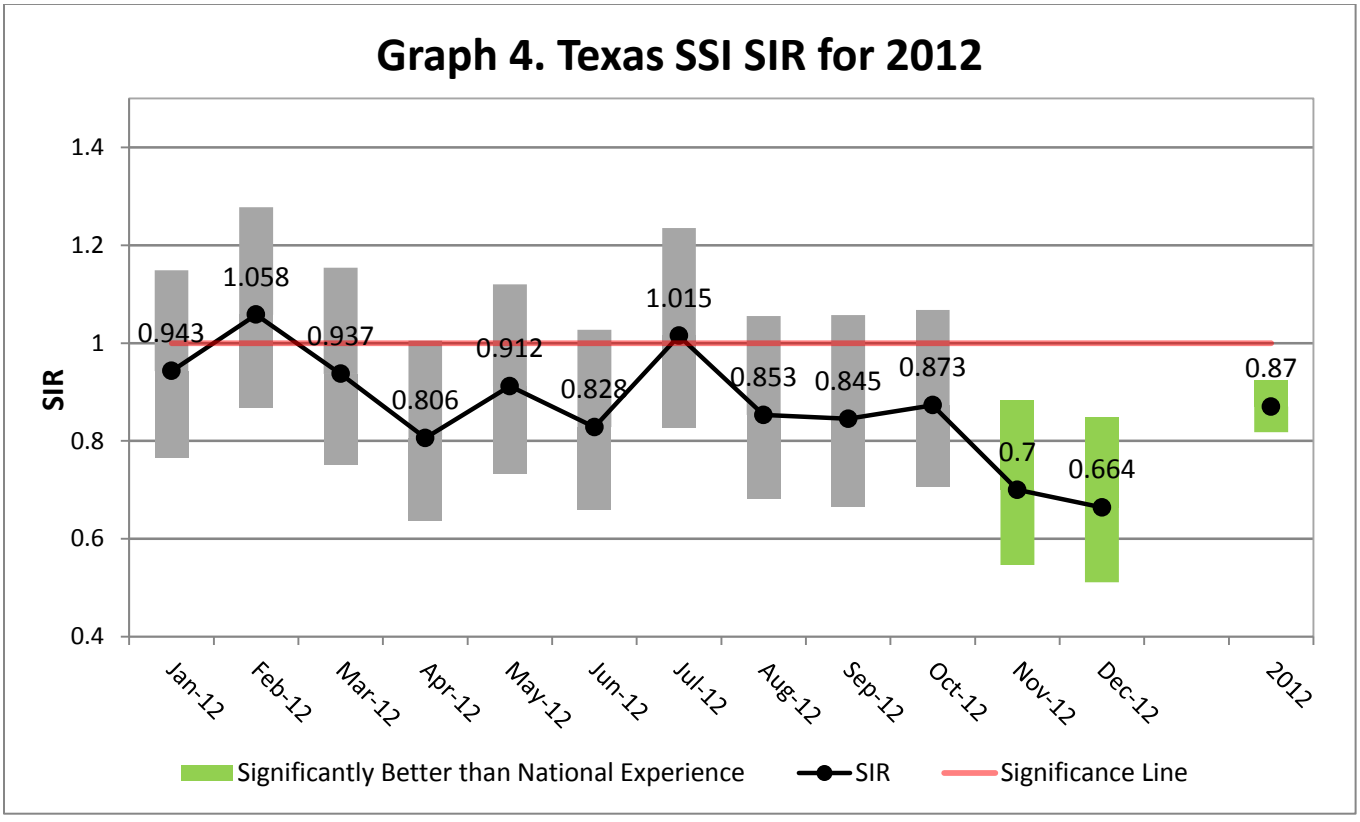
Health Service Region	Procedure Count	# of SSIs	Predicted # Infections	SIR	SIR p-value	95% Confidence Interval
HSR 1	4,778	47	66.14	0.711	0.0084	0.519 - 0.950
HSR 2/3	26,745	287	374.60	0.766	0	0.678 - 0.862
HSR 4/5N	6,608	99	90.12	1.099	0.1874	0.889 - 1.343
HSR 6/5S	19,607	224	309.80	0.723	0	0.630 - 0.826
HSR 7	9,436	158	124.69	1.267	0.0023	1.074 - 1.485
HSR 8	8,516	155	119.78	1.294	0.0011	1.095 - 1.519
HSR 9/10	4,154	35	52.61	0.665	0.0065	0.460 - 0.931
HSR 11	5,906	68	96.59	0.704	0.0014	0.544 - 0.896

As was done with the CLABSI SIR data, DSHS compiled overall monthly SIR data for SSIs in order to identify data trends occurring over time. Graph 4 shows the overall Texas SSI SIR by month and overall for the 2012 reporting year.

As for the CLABSI SIR graph, this SSI SIR graph shows each month is represented by a vertical bar that indicates the 95% confidence interval (CI) and a black circle that indicates the SIR value for a given month. The overall SSI SIR for all of 2012 is shown on the far right.

A red line is drawn horizontally at 1 and indicates whether the SIR is significant. If the vertical 95% CI bar crosses the red line, the SIR is not significant and the bar is colored gray. If the vertical bar is completely above the red significance line, the bar is colored red to show that the SIR is significantly higher/worse than the national experience. If the bar is completely below the red significance line, the SIR value is significantly lower and indicates it is better than the national experience. The vertical bars are shown in green if this is the case.

Graph 4 shows that at the beginning of the year, the SIR indicated that the Texas SSI experience was about the same as the national experience. Over the course of the year the SSI SIR trended downward. In November and December, the SIRs were statistically significantly lower and indicated that the Texas SSI experience was better than the national benchmark.



Infection Preventionist Summary Tables

Infection Preventionists (IPs) lead programs in health care settings that protect patients, visitors, volunteers, and health care providers from acquiring health care associated infections (HAIs). The quality and effectiveness of a facility's infection prevention program often depends on the facility's available resources, such as personnel. The number of IPs in a facility varies widely and is often dependent on the size of the facility or the complexity of the services provided by that facility. For example, small critical access hospitals that generally have less than 25 beds, will usually have only one person designated to run the infection prevention program. Often times, this same person wears multiple hats and manages the quality department, employee health and may even perform clinical duties. On the other hand, a large teaching hospital with 500 beds may have a team of 5 IPs dedicated only to infection prevention activities. CDC recommends a ratio of 0.8 to 1.0 IPs per 100 acute care beds as the optimal staffing for infection prevention programs.

In addition to the number of IPs in a facility, the qualifications of the IPs may also affect the quality of a facility's infection prevention program. IPs can obtain a Certification in Infection Prevention and Control (CIC®) (demonstrating a mastery of knowledge) by passing a comprehensive examination developed by the Certification Board of Infection Control & Epidemiology (CBIC). The assumption is that those who are certified are more likely to be aware of evidence based practices and are more effective at preventing infection transmission in health care settings, when compared to their non-certified peers. A list of CIC® certified IPs can be found on the CBIC website.

Table 24 contains information for those facilities that provided IP and hospital bed size data through NHSN. It combines these data with the 2012 CLABSI SIR data and the CBIC IP database listing CIC® certified IPs. Only those facilities with calculated CLABSI SIRs were included in this table.

The table shows the total number of facilities for each region, along with the ratio of total staffed hospital beds per IP (total number of IPs in a facility), the ratio of total staffed beds per total IP hours (the total number of hours a week that an IP performs all IP job duties) and the ratio of total staffed beds per IP surveillance hour (the number of hours a week that an IP performs HAI surveillance duties). The average CLABSI SIR is also shown by region. It is important to note that the average CLABSI SIR includes both SIRs that were statistically significant and those that were not. The number and percent of facilities in each region with at least one CIC® certified IP is also displayed in this table.

The average ratio in Texas for the number of staffed beds to IPs was 167 beds per IP and approximately 5 beds per total IP work-hour. On average and for each of the HSRs, the CDC recommended 100 beds per 0.8 – 1.0 IPs is not met. This indicates a need to provide general infection prevention training on a regular basis throughout the state as well as education to health

care facility administrators emphasizing the need for adequate staffing in light of the increased regulatory demands (CMS and state reporting mandates) on infection prevention departments.

There does not seem to be a correlation between CLABSI SIR and ratio of staffed beds to IPs, staffed beds to total IP hours or staffed beds to total surveillance hours.

To determine where additional infection prevention training should be targeted, the percent of facilities with at least one CIC® certified IP is shown in the final column. Throughout Texas, approximately 61% of reporting facilities have at least one IP who is CIC® certified. The HSRs with the lowest percent of facilities with a certified IP are HSR 1, 2, 5 and HSR 10. Therefore, these health service regions should be targeted for future DSHS sponsored infection prevention training and CIC® certification courses.

Table 22. Infection Preventionist (IP) Summary†

Health Service Region	Total Facilities in Region with Survey and CLABSI SIR data (N)	Total Staffed beds to total IPs	Total staffed beds to total IP hours	Total staffed beds to total surveillance hours	Average CLABSI SIR in region*	# of facilities with ≥ 1 CIC‡	% of facilities with ≥ 1 CIC‡
1	6	202	7.2	16.2	0.437	0	0%
2	3	212	5.3	9.5	0.108	1	33%
3	47	149	4.2	9.3	0.402	28	60%
4	7	160	5.0	10.1	0.551	4	57%
5	8	177	5.6	9.2	0.436	3	38%
6	40	146	5.0	11.6	0.642	30	75%
7	18	145	4.7	8.6	0.426	13	72%
8	20	191	4.8	11.9	0.544	13	65%
9	4	189	7.0	12.6	0.385	2	50%
10	6	243	6.3	21.5	0.507	1	17%
11	21	200	6.1	13.0	0.798	15	71%
Texas	**180**	**167**	**5.1**	**11.2**	**0.526**	**110**	**61%**

†Table includes only data for facilities with 2011 NHSN Survey data and 2012 CLABSI SIR data
**SIR data do not take into consideration the significance level*
‡CIC data based on CBIC online database accessed April 2013 and facility contact information, current as of April 2013.

Conclusions

In Texas, 2012 was the first full year of mandatory HAI reporting by general hospitals and ambulatory surgery centers. Facility-specific Data Display Reports for January to June 2012 and July to December 2012 were published on a public website on December 2012 and June 2013, respectively. This represents a significant step toward increasing health care transparency and accountability in the state of Texas. This significant milestone in HAI reporting demonstrates both the state's as well as our facilities' commitment to health care safety.

Data Trends

The DHHS National Action Plan to Prevent Healthcare-Associated Infections called for a 50% reduction in CLABSI occurrence in ICUs or a SIR of 0.5 and a 25% reduction in admission and readmission SSI or 0.75 SIR by the end of 2013 (Agency for Healthcare Research and Quality, 2008). Texas was just shy of reaching these goals in 2012. The Texas CLABSI SIR for 2012 was 0.55 (p-value = 0; 95% CI 0.520 – 0.589) and 0.87 (p-value = 0; 95% CI 0.818 – 0.925) for the state-wide SSI SIR. Although, Texas is on track to meet the national goals, continued efforts are needed to ensure that these infections decrease over time.

During this first year of reporting, DSHS has learned many lessons that will help guide the program into the next year of HAI reporting.

Use of NHSN

As the most widely used online HAI surveillance system in the United States, NHSN provides facilities with a secure and confidential data repository that enables facilities to view their data and share information with clinicians and administrators to improve health care quality. NHSN also provides the public with credible HAI data from over 11,500 health care facilities in all 50 states. Participating health care facilities include acute care hospitals, long-term acute care hospitals, rehabilitation hospitals, outpatient dialysis centers, ambulatory surgery centers, and nursing homes.

Advantages

NHSN provides a useful tool for reporting HAI data from a large number of facilities and has been an integral part of successfully implementing mandatory HAI reporting in Texas. In addition to the advantages detailed previously in this report, other benefits of using NHSN for HAI surveillance are the analytic tools that enable facilities to benchmark the progress of their infection prevention efforts. The data analysis tools also enable facilities to identify opportunities to improve patient outcomes and eliminate HAIs. These data can also be analyzed on a national,

state and local level to identify emerging infection trends and to measure progress toward HAI elimination.

However, along with the advantages of using NHSN, there are also some caveats to its use.

Caveats

The NHSN calculated SIR provides a means for accurately comparing health care facilities to the national experience by taking into account variations in types of facilities and patient populations. CDC conducts continuous analyses of potential risk factors to determine which factors affect HAI occurrence and adjusts risks as needed. However, these risk adjustment methods may not account for all differences between health care facilities and populations. Therefore, it is important for the public to understand this shortcoming when reviewing the facility-specific HAI data reports and the data presented in this and future annual Texas summary reports. The SIR is only one tool that can be used to make informed health care decisions. It is also important to note that health care facilities with higher SIRs do not necessarily have better performance than those with lower SIRs. The SIR only provides an accurate comparison of a health care entity's HAI experience to that of the national HAI experience, and not to other facilities.

Also important to note is that because the referent data for the SIR calculations was collected before many state's implementation of HAI reporting, many of the facility types and infection types do not have sufficient baseline data to use for comparison. Because of this, Texas is unable to obtain SIR data for (1) SSIs related to heart transplants, (2) any SSI data from ASCs and (3) CLABSI data from Long Term Acute Care Hospital (LTAC) ICUs. This will only be remedied when NHSN chooses a new referent period that contains enough baseline data for these HAIs.

Updates to the NHSN system occur frequently. Occasionally, these changes require modifications to the TxHSN data upload process or even the application's structure. While most of these modifications are minor, others are critical changes and adversely affect Texas' reporting process. One such critical change will affect future trending of HAI data. The standardized HAI surveillance definitions were revised for 2013 and will likely cause artificial fluctuations in case counts for CLABSI and SSI and therefore, to the SIR calculations. This change and any subsequent changes to the NHSN HAI surveillance definitions must be taken into account when tracking HAI temporal variation.

Next Steps

The completion of the first annual summary report on HAIs in Texas is a huge milestone for DSHS. However, we still have to make progress on implementation of a complete and comprehensive health care safety program. Here are a few goals we hope to accomplish in the coming years.

Training

DSHS will continue to partner with various professional organizations to provide education and training to health care professionals throughout the state. In the coming years, DSHS plans to provide continuing education for health care facilities via regular webinars and conference calls. The purpose of which will be to provide reporting updates to facilities and review HAI definitions via case study discussion. This will also allow DSHS staff to field questions from health care professionals. In addition to this ongoing training, Texas sponsored two Infection Prevention courses that were conducted by the Texas Society of Infection Control and Prevention (TSICP) in 2013.These courses provided introductory-level infection prevention education to new and less experienced Infection Preventionists (IPs) in Texas. The objective was to train IPs in the principles of infection prevention and give them the tools to develop an effective infection prevention program in their facilities.

In addition to IP training, DSHS is also evaluating the benefit of conducting a C*lostridium difficile* associated disease (CDAD) prevention collaborative in the coming fiscal years. This collaborative would involve a stakeholder organization working with DSHS to determine the incidence of CDAD in Texas health care facilities and implement reduction measures in participating facilities.

Reporting

In 2013, DSHS will continue to track the same indicators that were reported in 2012 as well as HAI data related to carotid endarterectomies, peripheral vascular bypass grafts, abdominal aortic aneurysm repairs, colon surgeries, abdominal hysterectomies and vaginal hysterectomies for ASCs and adult general hospitals. Pediatric hospitals will be required to report HAI data related to laminectomies, spinal fusions and refusions in addition to the HAIs they reported in 2012. On April 12th, 2013, an amendment to the 25 TAC Chapter 200 was posted to the Texas Register. This change to the rules for reporting added catheter associated urinary tract infections (CAUTIs) reporting in ICUs by all general hospitals starting July 2013. This will cause no additional burden for health care facilities because most facilities are already reporting these data to CMS via NHSN.

Data Quality

DSHS will continue to monitor HAI data for unusual pathogen clusters and perform any necessary follow-up activities to determine the cause of such occurrences. Site visits to facilities with significantly high SIRs will continue in order to ensure accurate use of NHSN case definitions. In the future, DSHS is planning on conducting a comparative analysis on hospital discharge data and NHSN data submitted for mandatory reporting. In doing this, DSHS will be able to identify facilities that may be under-reporting SSI data and perform any necessary follow-up and education. In addition to discharge data comparisons, DSHS evaluating resources to determine whether CLABSI validation study modeled on the NHSN sample validation protocol can be conducted to identify facilities that may be under-reporting CLABSI data.

The Department is committed to providing useful HAI data for the health care community and the public. DSHS will continue to work with the Health Care Safety Advisory Panel, Infection Preventionists and health care professional organizations to collect quality data from health care facilities around the state and will work together to enhance data accuracy and promote HAI reduction measures.

Appendices

Appendix A: Glossary of Terms and Abbreviations

Acute Care Facility: Defined by Texas Administrative Code Chapter 353 as a facility/hospital that provides acute care services such as medical, surgical, and/or psychological services.

American Society of Anesthesiologists (ASA) Score: A system for assessing the physical health of patients before surgery. These are:

1. A normal healthy patient.
2. A patient with mild systemic disease.
3. A patient with severe systemic disease.
4. A patient with severe systemic disease that is a constant threat to life.
5. A moribund patient who is not expected to survive without the operation.

Ambulatory Surgical Centers (ASCs): Defined by the Texas Health and Safety Code Chapter 243 as a facility that operates primarily to provide surgical services to patients who do not require overnight hospital care.

Catheter-Associated Urinary Tract Infection (CAUTI): Infection involving any part of the urinary system, including urethra, bladder, ureters, and kidney that is caused by the insertion of a urinary catheter.

Central line-associated blood stream infection (CLABSI): The National Healthcare Safety Network (NHSN) defines a CLABSI as a blood stream infection in a patient that had a central line in place at the time of or within 48-hours before the development of the bloodstream infection.

Central line catheter: A long flexible tube that is inserted near a patient's heart or into one of the large blood vessel near the heart. A central line can be used to administer fluids, antibiotics, or medical treatments such as chemotherapy. Central lines are also sometimes called central venous lines, central venous catheters and C-lines.

Central line days: A daily count of the number of patients with a central line in a patient care location during a specific time period. For each day of the month, the number of patients who have a central line is recorded. At the end of the month the sum of the daily counts is used as the central line days for the given month.

Central Line Utilization Ratio: This ratio comes from dividing the number of central line-days by the number of patient days. It is sometimes used to monitor appropriate use of central lines.

CLABSI Infection Rate: This is the total number of central line-associated bloodstream infections divided by the number of central line days. That result is then multiplied by 1,000.

***Clostridium difficile* associated disease (CDAD)/*Clostridium difficile* Infections (CDI):** *Clostridium difficile (C. difficile)* is responsible for a spectrum of *C. difficile* infections (CDI) or *C. difficile* associated disease (CDAD), including uncomplicated diarrhea, pseudomembranous colitis, and toxic megacolon which can, in some instances, lead to sepsis and even death.

Confidence Interval (CI): This is a statistical measure that determines statistical significance. If the CI contains the value 1.0, then there is no significance and the null hypothesis (which indicates there is no difference between test and control populations) can be accepted. If the CI does not contain the value 1.0, then the difference between the test and control populations is statistically significant. Example: (CI 0.02 – 1.2) is not significant and (CI 0.02 – 0.08) is significant

Contamination: To make impure, infected, corrupt, etc, by contact with or addition of something; to pollute something. This occurs when foreign material invades another material either intentionally, by accident, or as a consequence of another set of actions. Cross contamination is where someone or something that is already contaminated transfers the contamination to another person or object.

Critical Access Hospital (CAH): A small, generally geographically remote facility that provides outpatient and inpatient hospital services to people in rural areas. The designation was established by law, for special payments under the Medicare program. To be designated as a CAH, a hospital must be located in a rural area, provide 24-hour emergency services; have an average length-of-stay for its patients of 96 hours or less; be located more than 35 miles (or more than 15 miles in areas with mountainous terrain) from the nearest hospital or be designated by its State as a "necessary provider". Hospitals may have no more than 25 beds.

Denominator: This is the number of people (population) who are potentially capable of experiencing the event or outcome of interest. The denominator, along with the numerator, is used to calculate rates. The denominator is the bottom half of a fraction.

Dialysis facility: An outpatient facility where dialysis is given to people with end stage kidney disease.

Health care-associated infection (HAI): Health care-associated infections are infections that patients acquire during the course of receiving treatment for other conditions within a health care setting. For an infection to qualify as an HAI, there must be no evidence that it was present or incubating at the time of hospital admission.

HAI Prevention Collaborative: A group of facilities that are engaged in an effort to improve an outcome, in this case to reduce HAIs. The group members discuss progress regularly and share lessons learned in real time so that others in the group can benefit from the experience of each facility.

ICD-9-CM: ICD-9-CM (sometimes referred to as just ICD-9) stands for the "International Classification of Diseases - 9th revision - Clinical Modification." All diagnoses (or conditions)

and all procedures that patients receive in the hospital are assigned an ICD-9-CM code. The coding and terminology provide a uniform language that permits consistent communication on claim forms.

Intensive Care Unit (ICU): A nursing care area that provides intensive observation, diagnosis, and therapeutic procedures for adults and/or children who are critically ill.

Infection: An infection occurs when a pathogen (e.g. viruses, bacteria, parasites, etc.) enters the body and causes harm.

Infection control/prevention: This is how infection preventionists prevent health care associated infections and other adverse outcomes in the health care setting. Examples include the use of hand washing, gown, gloves, masks, special cleaning products and isolation of people with contagious diseases in order to prevent another patient from contracting the disease and becoming sicker.

Infection Preventionist (IP): Previously known as an Infection Control Practitioner (ICP). This is a health care professional who is responsible for preventing infection transmission within health care facilities.

Infection Rate: An infection rate is the number of infections reported in a specified period of time (the numerator) divided by the number of exposures to an infection during the same specified period of time (the denominator).

Knee Replacements, Total or Partial: Knee replacement surgery (arthroplasty) is an elective procedure for people with severe knee damage and pain related to osteoarthritis, rheumatoid arthritis, and traumatic arthritis. A total knee replacement involves removing the damaged cartilage and bone from the surface of the knee joint and replacing them with a man-made surface of metal and plastic. A partial knee replacement involves replacing only part of the knee joint.

Mandate: A law or rule issued by a state or federal government agency about the way a public issue is to be carried out. (e.g., A facility must report health care-associated infections to NHSN).

Methicillin-resistant *Staphylococcus Aureus* (MRSA): MRSA causes an infection that is resistant to several common antibiotics. There are two types of infection. Hospital-associated MRSA happens to people in health care settings. Community-associated MRSA can occur to people who have close skin-to-skin contact with others, such as athletes involved in football and wrestling.

National Healthcare Safety Network (NHSN): The data reporting system that Texas health care facilities must use to send HAI reports to DSHS. NHSN is a secure, internet-based surveillance (monitoring and reporting) system.

Neonatal Intensive Care Unit (NICU): An intensive care unit designed with special equipment to care for premature or seriously ill newborns.

Nosocomial: Originating or taking place in a hospital.

Numerator: The number of individuals who actually experience the event or outcome of interest. The numerator, along with the denominator, is used to calculate rates. The numerator is the top half of a fraction.

P-value: This is a statistical measure that determines statistical significance. If the p-value is $\geq$ 0.05, then there is no significance and the null hypothesis (which indicates there is no difference between test and control populations) can be accepted. If the p-value is < 0.05, then the difference between the test and control populations is statistically significant.

Pathogens: Bacteria, viruses, parasites, or fungi that can cause disease; a specific organism that causes a disease, such as bacterium or a virus.

Preventable Adverse Event (PAE): A preventable adverse event or PAE is defined as an adverse health care-associated condition or event for which the Medicare program will not provide additional payment to the facility under a policy adopted by the federal Centers for Medicare and Medicaid Services; or an event included in the list of adverse events identified by the National Quality Forum.

Protocol: A written set of rules to follow.

Standardized Infection Ratio (SIR) Statistical Method: The SIR is a number that compares the number of HAIs that occur in a facility to a predicted number of infections based on historical data and risk adjusted. A SIR is the number of observed infections divided by the number of expected infections. A SIR of 1.0 means the observed number of infections is equal to the number of expected infections. SIRs above 1.0 mean that the infection rate is higher than that found in the "standard population." SIRs below 1.0 mean that the infection rate is lower than that found in the "standard population." For HAI reports, the standard population comes from data reported by the hundreds of U.S. hospitals that use the National Healthcare Safety Network (NHSN) system.

Surgical Site Infection (SSI): SSIs are infections that occur as the result of surgical procedures.

Surveillance: A process for ongoing monitoring of information (data) about a specific topic, problem, or disease (such as health care-associated infections) where data are gathered, analyzed, and interpreted. Surveillance data are often used to identify areas for improvement, guide actions to improve the quality of health care delivery, and monitor whether those interventions result in better outcomes.

List of Abbreviations/Acronyms	
Acronym	**Description**
AAA	Abdominal Aortic Aneurism repair surgery
APIC	Association for Professionals in Infection Control and Epidemiology
ASA	American Society of Anesthesiologists
ASC	Ambulatory Surgery Center
CARD	Cardiac Surgery
CAUTI	Catheter associated urinary tract infections
CBGB	Coronary Artery Bypass Graft with both chest and donor site incisions
CBIC	Certification Board of Infection Control and Epidemiology
CBGC	Coronary Artery Bypass Graft with chest incision only
CDAD	*Clostridium difficile* associated disease
CDC	Centers for Disease Control and Prevention
CEA	Carotid Endarterectomy
CI	Confidence Interval
CIC	Certification in Infection Prevention and Control
CLABSI	Central Line-Associated Blood Stream Infection
CMS	Centers for Medicare and Medicaid Services
COLO	Colon Surgery
DSHS	Texas Department of State Health Services
DHHS	Department of Health and Human Services (U.S)
DHQP	Division of Healthcare Quality Promotion at the CDC
FUSN	Spinal Fusion surgery
HAI	Health care-associated infection
HICPAC	Healthcare Infection Control Practices Advisory Committee
HPRO	Hip Prosthesis surgery
HSR	Health Service Region
HTP	Heart Transplant surgery
HYST	Abdominal Hysterectomy
ICD-9	International Classification of Diseases, Ninth Revision
ICU	Intensive Care Unit
IP	Infection Preventionist
KPRO	Knee Prosthesis surgery
LAM	Laminectomy surgery
MDRO	Multidrug-resistant organism
MRSA	Methicillin-Resistant *Staphylococcus aureus*
NHSN	National Healthcare Safety Network
NICU	Neonatal Intensive Care Unit
PAE	Preventable Adverse Event
POA	Present on Admission
PVBY	Peripheral Vascular Bypass Surgery

List of Abbreviations/Acronyms	
Acronym	**Description**
QIO	Quality Improvement Organization
RFUSN	Re-fusion of Spine surgery
SHEA	Society for Healthcare Epidemiologists of America
SSI	Surgical site infection
TAHQ	Texas Association for Healthcare Quality
TASCS	Texas Ambulatory Surgery Center Society
THAF	Texas Hospital Association Foundation
THAQ	Texas Association for Healthcare Quality
TMA	Texas Medical Association
THCIC	Texas Health Care Information Collection
TMF	Texas Medical Foundation
TSICP	Texas Society of Infection Control and Prevention
TXHSN	Texas Healthcare Safety Network
UTHSC	University of Texas Health Science Center
VHYS	Vaginal Hysterectomy surgery
VSHN	Ventricular Shunt surgery

Appendix B: Texas 2012 Advisory Panel Members

Physicians

- Edward Septimus, MD, Medical Director, Infection Prevention and Epidemiology, Healthcare Corporation of America, Inc., Houston
- Edward Sherwood, MD, Vice-Dean, Graduate and Continuing Medical Education, Texas A&M HSC College of Medicine, Round Rock
- Jane Siegel, MD, Professor of Pediatrics, UT Southwestern Medical Center, Dallas

Infection control professionals:

- Susan Sebazco RN, MBA, CIC, Infection Prevention Director, Texas Health Arlington Memorial Hospital, Arlington
- Charlotte Wheeler, RN, BSN, CIC, Infection Prevention Practitioner, Baptist St. Anthony's Health System, Amarillo
- Sharon Dorney, BSN, MSN, ADN, MPH, CIC, Infection Preventionist, North Texas Medical Center, Gainesville
- Judith Prescott, RN, BSN, Infection Prevention and Control Director, Baylor Health Care System, Dallas

Officer of a general hospital:

- Patricia Montague, BSN. MSN, Chief Nursing Officer, Christus Santa Rosa Children's Hospital, San Antonio

Officer of an ambulatory surgical center:

- Marilyn Christian, RN, BSN, CNOR, CASC, Chief Operating Officer, Advantage Surgical Partners, LLC, Houston

Quality assurance/performance improvement professionals:

- Darlene Adams, MSN, BSN, RN, Director of Quality Management, United Regional Health Care System, Wichita Falls
- Susan Mellott, PhD, Owner, Mellott Associates, Houston,
- Victoria Robinson, BSN, RN, Director of Nursing Quality, East Texas Medical Center, Tyler
- Steve Q. Quach, MD, Chief Medical Officer, UTMB, Galveston

Members representing the public as consumers:

- John James, PhD, MA, Chief Toxicologist NASA, Houston
- Linda Carswell, BA, Board member Jerry Carswell Scholarship Foundation, Katy

Public health professionals:

- Bruce Burns, DC, Center for Health Statistics, DSHS, Austin
- Mary L. Smith, RN, Nurse Consultant Facility Licensing Group, Regulatory Services, DSHS, Austin,
- Gary Heseltine, MD, MPH, Epidemiologist, Infectious Disease Control Branch, DSHS, Austin

Appendix C: Missing/Incomplete Alerts List

1. **Incomplete Events:** This alert will list any in-plan events with missing required data elements.

2. **Incomplete Procedures:** This alert will list those procedure records that have missing or incomplete data.

3. **Incomplete Summary Data:** This alert will list months of summary data in which a required field is missing. This may occur when a monthly reporting plan is updated to include an additional event(s) for a location after summary data have been entered initially.

4. **Missing Procedures:** This alert will list those months in which NHSN operative procedure categories were listed in your monthly reporting plan and no procedures have been reported to NHSN.

5. **Missing Procedure Associated Events:** This alert will list those months in which NHSN operative procedures were reported in-plan and no in plan procedure associated events have been reported to NHSN.

6. **Missing Events:** This alert will list months in which events from the device-associated modules were entered in the monthly reporting plan and summary data have been reported to NHSN, but no events have been reported.

7. **Missing Summary Data:** This alert will list months in which events from the device-associated modules were entered in the monthly reporting plan, but no summary data have been entered.

(The Centers for Disease Control and Prevention, 2011)

Appendix D. Audit Protocol for TXHSN
(Note: For Audit Protocol Appendices, go to www.HAITexas.org)

Background:

In 2007, the Texas Legislature as part of the Health and Safety Act, passed Chapter 98 mandating public reporting of selected infection rates for health care facilities. Part of that mandate stipulates that the department shall review the infection control and reporting activities of health care facilities to ensure the data provided by the facilities is valid and does not have unusual data patterns or trends that suggest implausible infection rates."

This audit will consist of performing on-site record review at selected facilities. It will assess completeness and accuracy of reporting for CLABSI and reportable surgical procedures and related SSIs using a standardized set of forms to capture data.

Objectives:

- Determine reliability and consistency of surveillance
- Gain a better understanding of how NHSN surveillance protocols were understood and being applied
- Provide immediate one-on-one education and coaching if needed to help improve data quality and staff skills in volunteer hospitals
- Develop targeted education and training to all TX hospitals based on common errors, identified gaps, misinterpretations

METHODS

The audit protocol was developed by the Texas Department of State Health Services HAI Team by reviewing recent protocols used by other states that have conducted similar validation projects and NHSN Guidance in conjunction with input from the Emerging and Infectious Disease Prevention section.

Time Period

a. Time period to be audited for Validation: January – June, 2012

Staffing

Initially this will be one Public Health and Prevention Specialist or Clinical Specialist (Data Validation Specialist), experienced in medical terminology, health care facility processes, TXHSN reporting and NHSN reporting. The person(s) conducting audits must be trained in NHSN specifications, remain up-to-date when changes are made, and commit to using current NHSN methods and definitions to validate HAI data reported to the system.

Experience working in infection control is an advantage for auditors but does not necessarily assure (and cannot substitute for) rigorous implementation of current NHSN definitions and surveillance methods. When clinical experience is at odds with surveillance case-definitions, it must be set aside for reporting and validation. All auditors should demonstrate attention to detail

and have experience in conducting systematic record reviews. Developing expertise in NHSN takes time, effort, and mentoring. Willingness to seek help when needed from NHSN on definitions and criteria is important in assuring that a standard approach is used to determine whether or not a difficult case meets NHSN specifications for an HAI. If facilities and auditors cannot agree on case-status using the NHSN case-definition, the case should be referred to CDC for adjudication.

Hospital Selection

From analysis of NHSN data, facilities that had outlier SIRs were chosen with equal focus on CLABSI reporting and Procedure reporting. CLABSI outliers were identified as those individual units that had a SIR > 1 and a p-value that indicated statistical significance. SSI outliers were identified as those facilities with an overall SSI SIR > 1 and a p-value that indicated statistical significance.

Chart Selection

For each facility, charts from all infections reported to NHSN will be requested for review. These charts will be requested ahead of time to allow facilities sufficient time to assemble the requested documents.

Site Visit

A site visit provides the opportunity to explore barriers to correct reporting, to discuss possible solutions, and if necessary, to meet face-to-face with key facility authorities.

An infection preventionist in each selected hospital will be notified by telephone in late December, 2012 about the project. Subsequently, an administrator in each selected hospital will receive a letter outlining the validation project (Appendix A), with an e-mail carbon copy disseminated to an infection preventionist in each of the facilities.

Prior to the site visit, facilities will be sent an e-mail describing the on-site audit process and a scheduling form on which they will indicate their availability for an on-site audit (Appendix B). Each facility will designate an Audit Liaison who will have the following responsibilities:

- handling the logistics of the audit including scheduling the site visit
- greeting the Clinical specialist upon arrival at the hospital
- facilitating physical access to medical records and assuring that the Clinical specialist signs appropriate data confidentiality documents
- arranging for the Clinical specialist to interview key staff involved in the collection of numerator and denominator data

- The Clinical Specialist will work with the assigned facilities to determine if electronic medical records would be copied onto paper or viewed directly on a computer. Once a site visit date has been arranged between the Audit Liaison and Clinical specialist, a letter

is sent to the facility indicating which medical records are to be reviewed (Appendix C). Site visits will be scheduled to allow for sufficient time to pull the charts and complete other applicable paperwork to enable access to medical records.

- To address questions related to data protection and confidentiality, a letter is prepared and signed by the state health commissioner, describing the authority to review medical records and the responsibility of the Clinical specialists to protect patient and provider confidentiality. A copy of the letter will be given to the facility in advance if requested and made available during the audit (Appendix D).
- On the day(s) of the site visit, the Clinical specialist will
    1. Hold an opening conference. He/she will meet with a representative of their infection control program for approximately 30 minutes at the beginning of the visit (to be oriented to the way records are maintained there), and again at the end of the visit (to share findings and reconcile any points they might dispute). They may want to have the administrator to whom they report present at the end-of-visit meeting, and that person would be welcome to attend both meetings
    2. Interview appropriate facility personnel in order to capture surveillance methodology, data collection practices, and adherence to NHSN protocol. Interview attendees will use a standardized sign-in sheet to note participation in the on-site interview (Appendix E and F). When applicable, the Clinical specialists will provide education based on responses to the in-person interview.
    3. Observation and verification of surveillance methodology and data collection practices
    4. Review charts, applying NHSN CLABSI and SSI case definitions, and abstracting data. A standard data collection form will be used to abstract the data (Appendix G and H). If the Clinical specialist has a question about a difficult/ambiguous case, they will confer with NHSN to make a final determination.
    5. During site visit and after medical record abstraction, meet with IP to discuss discrepancies

Responsibilities of Infection Preventionists

- Designate an Audit Liaison to be responsible for:
    - handling the logistics of the audit including scheduling the site visit
    - greeting the Clinical specialist upon arrival at the hospital
    - facilitating physical access to medical records and assuring that the Clinical specialist signs appropriate data confidentiality documents
    - arranging for the Clinical specialist to interview key staff involved in the collection of data

- Complete an interview with the Clinical specialist and any other staff involved with surveillance during the on-site visit
- Discuss case classification when there is a discrepancy between the Clinical specialist and what is entered in NHSN

Responsibilities of Clinical Specialists

- Attend training on NHSN protocols
- Contact IP in assigned facilities to discuss audit process
- Send assigned facilities a list of medical record numbers and collection dates for records to be reviewed
- Work with assigned facilities to schedule site visits
- Sign any relevant data confidentiality documents
- Conduct site visits including reviewing charts, interviewing staff, and conferring with NHSN on difficult/ambiguous cases
- Resolve discrepancies in case classification with assigned facilities, as necessary
- Provide input into training on lessons learned from validation project

General Timeline of Validation Project

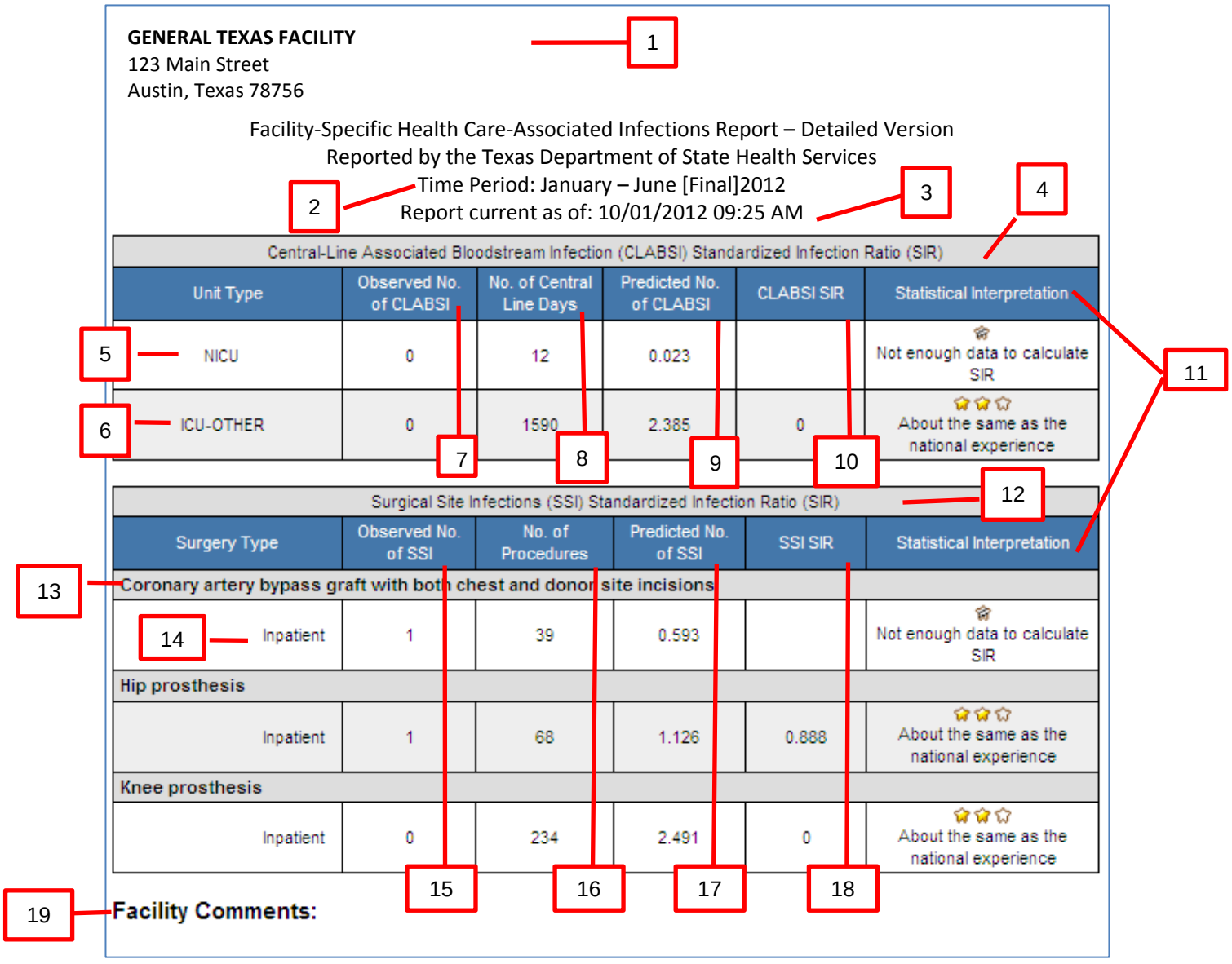
- IPs contacted outlining overview of validation
- Letter sent to each selected facility's administrator (with a carbon copy to IP) outlining the validation project
- Clinical specialist assigned to facility will contact IP to discuss schedule and list of records to be audited. Clinical specialist will work with IP to set up a date for site visit far enough in advance so that desired records will be available electronically or by paper copy and IP will be available
    - List will include medical record number and event/specimen collection date
    - Any necessary data confidentiality forms will be signed by Clinical specialist

- Site visits will be held
- Summary of findings sent back to facilities

Appendix E: Sample Facility-Specific HAI Report

The Facility-Specific HAI Report is created for each healthcare facility on a semi-annual basis. These reports may be lengthy and difficult to understand. In order to understand what the report is telling us, it is important to know what each of the data elements on the report means.

Below is a sample of what a non-existent General Hospital's HAI report would look like. Different parts of the report are numbered. See below for an explanation of each numbered part of the report.



GENERAL TEXAS FACILITY 1
123 Main Street
Austin, Texas 78756

Facility-Specific Health Care-Associated Infections Report – Detailed Version
Reported by the Texas Department of State Health Services
2 Time Period: January – June [Final]2012 3
Report current as of: 10/01/2012 09:25 AM 4

Central-Line Associated Bloodstream Infection (CLABSI) Standardized Infection Ratio (SIR)

Unit Type	Observed No. of CLABSI	No. of Central Line Days	Predicted No. of CLABSI	CLABSI SIR	Statistical Interpretation
5 NICU	0	12	0.023		Not enough data to calculate SIR
6 ICU-OTHER	0	1590	2.385	0	About the same as the national experience

7 8 9 10 11

Surgical Site Infections (SSI) Standardized Infection Ratio (SIR) 12

Surgery Type	Observed No. of SSI	No. of Procedures	Predicted No. of SSI	SSI SIR	Statistical Interpretation
13 Coronary artery bypass graft with both chest and donor site incisions					
14 Inpatient	1	39	0.593		Not enough data to calculate SIR
Hip prosthesis					
Inpatient	1	68	1.126	0.888	About the same as the national experience
Knee prosthesis					
Inpatient	0	234	2.491	0	About the same as the national experience

15 16 17 18

19 **Facility Comments:**

1. Health care Facility Information – This shows the name of the facility and the physical address.

2. Summary Data – This is the section that shows the time period that these data refer to. In this example, we are looking at Jan – June 2012 data.

3. Report Current As of – This is the date and time that these data were obtained. Any changes to the reported data made after this date will not be reflected in this report. For example, if a facility realized they made a mistake and needed to go back and correct their data, and changes made after this date and time will not show up in this report.

4. Central-Line Associated Bloodstream Infection (CLABSI) Standardized Infection Ratio (SIR) – this is the CLABSI section. All data in this table only refers to CLABSI data for this facility.

5. NICU – This is a composite of all the NICU locations for this facility. If there is only one NICU in this facility, then only that NICU's data are displayed in this row.

6. ICU – This is a composite of all the ICU locations for this facility. If there is only one ICU in this facility, then only that ICU's data are displayed in this row.

7. Observed No. of CLABSI – This is the number of CLABSIs that occurred in the facility for the given time period.

8. No. of Central Line Days – This is the number of days that a central line was in place for each patient that was in this unit. This number is calculated by counting the number of patients with a central line each day. Each day's count is then totaled for the entire reporting time period to get this number.

9. Predicted No. of CLABSI – This is the estimated number of CLABSI that is predicted to occur if the facility has the same infection rate as the national benchmark.
    - If the Observed number of infections > Predicted number of infections, then the facility has a higher rate of infection than the national benchmark
    - If the Observed number of infections < Predicted number of infections, then the facility has a lower rate of infection than the national benchmark
    - If the Observed number of infections = Predicted number of infections, then the facility has the same rate of infection as the national benchmark.

    NOTE: If the Predicted number of infections is less than 1, then there is not enough data to calculate a SIR.

10. CLABSI SIR – This is a ratio of the Observed number of infections to the Predicted number of infections.
    - If the CLABSI SIR > 1, then the facility has a higher rate of infection than the national benchmark
    - If the CLABSI SIR < 1, then the facility has a lower rate of infection than the national benchmark
    - If the CLABSI SIR = 1, then the facility has the same rate of infection as the national benchmark.

    NOTE: If the Predicted number of infections is less than 1, then there is not enough data to calculate a SIR.

11. Statistical Interpretation: This interpretation takes into account whether the difference between the facility and the national experience is significantly different. If it is not statistically significant, then the facility is considered to have about the same experience as that of the nation.
    - (3 stars) Better than the national experience: this means that the facility has a lower rate of infection than the average healthcare facility.
    - (2 stars) About the same as the national experience: this means that the facility about the same rate of infection than the average healthcare facility.
    - (1 star) Worse than the national experience: this means that the facility has a higher rate of infection than the average healthcare facility.
    - Not enough data to calculate SIR: this means that the facility doesn't have enough patients with central lines in their ICU/NICU to be able to reliably determine whether they are doing better, worse or the same as the nation.

12. Surgical Site Infections (SSI) Standardized Infection Ratio (SIR) – this is the SSI section. All data in this table only refers to SSI data for this facility.

13. Surgery Type – This is the type of surgical procedure.

14. Inpatient or Outpatient – This indicates whether they are Inpatient procedures (meaning the patient was admitted and discharged on different dates) or if they were performed as an outpatient procedure (meaning the patient went to an Ambulatory Surgery Center or the operation was performed on the same day they were admitted and discharged from a hospital).

15. Observed No. of SSI – This is the number of SSIs that occurred for this facility during the reporting time period.

16. No. of Procedures – This is the number of surgical procedures performed at this facility for the given time period.

17. Predicted No. of SSI – This is the estimated number of SSI that is predicted to occur if the facility has the same infection rate as the national benchmark.
    - If the Observed number of infections > Predicted number of infections, then the facility has a higher rate of infection than the national benchmark
    - If the Observed number of infections < Predicted number of infections, then the facility has a lower rate of infection than the national benchmark
    - If the Observed number of infections = Predicted number of infections, then the facility has the same rate of infection as the national benchmark.

    NOTE: If the Predicted number of infections is less than 1, then there is not enough data to calculate a SIR.

18. SSI SIR – This is a ratio of the Observed number of infections to the Predicted number of infections.
    - If the SSI SIR > 1, then the facility has a higher rate of infection than the national benchmark
    - If the SSI SIR < 1, then the facility has a lower rate of infection than the national benchmark
    - If the SSI SIR = 1, then the facility has the same rate of infection as the national benchmark.

    NOTE: If the Predicted number of infections is less than 1, then there is not enough data to calculate a SIR.

19. Facility Comments: Each facility is given an opportunity to explain their data in this section. Please be sure to read this section of the report if comments are provided.

Appendix F: Predictive Risk Factors from the All SSI Logistic Regression Models	
NHSN Operative Procedure‡	**Risk Factor(s) – ALL SSIs**
AAA	duration
CBGB/C	age, asa, duration, gender, number of beds*
CARD	age, asa, duration
CEA	There were insufficient data for the following procedures in order to detect significant differences in risk, thus overall incidence will be used in the SIR calculations.
COLO	age, anesthesia, asa, duration, endoscope, medical school affiliation*, number of beds*, wound class
FUSN	approach, asa, diabetes, duration, medical school affiliation*, spinal level, trauma, wound class
HPRO	age, anesthesia, asa, duration, HPRO type, number of beds*, trauma
HTP	There were insufficient data for the following procedures in order to detect significant differences in risk, thus overall incidence will be used in the SIR calculations.
HYST	age, anesthesia, asa, duration, endoscope, number of beds*
KPRO	age, anesthesia, asa, duration, gender, KPRO type, number of beds*, trauma
LAM	anesthesia, asa, duration, endoscope
PVBY	age, asa, duration, gender, medical school affiliation*
RFUSN	approach, diabetes, duration
VHYS	age, asa, duration, medical school affiliation*
VSHN	age, medical school affiliation*, number of beds*, wound class

*These risk factors originate from the Patient Safety Annual Facility Survey

†All SSI = superficial incision, deep incisional, and organ/space SSI detected during admission, readmission, or post-discharge

(The Centers for Disease Control and Prevention, 2010)

Appendix G: HAI Antibiograms

2012 HAI Antibiogram, HSR 1

	aminoglycoside	cephalosporin	quinolone	carbapenem	penicillins		macrolide	folate inhibitor	lincosamide	oxazolidone	ansamycin	Tetracycline	glycopeptide
Pathogen Name	**Gentamicin**	**Ceftriaxone**	**Levofloxacin**	**Meropenem**	**Ampicillin**	**Oxacillin/Methicillin**	**Erythromycin**	**Trimethoprim/ Sulfamethoxazole**	**Clindamycin**	**Linezolid**	**Rifampin**	**Tetracycline**	**Vancomycin**
Gram-positive													
Enterococcus faecalis					(10) **80%**							(10) **40%**	(10) **80%**
Staphylococcus aureus	(24) **96%**		(12) **58%**			(23) **57%**	(25) **56%**	(22) **95%**	(24) **67%**	(15) **100%**	(15) **100%**	(25) **100%**	(24) **100%**
Staphylococcus epidermidis													(23) **100%**
Gram-negative													
Klebsiella pneumoniae	(11) **100%**	(10) **90%**	(11) **91%**	(11) **100%**	(11) **0%**								

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

2012 HAI Antibiogram, HSR 2/3

	aminoglycosides					b-lactam/b-lactamase inhibitors			cephalosporins							quinolones			carbapenems			macrolides		penicillins			folate inhibitor	lincosamide	lipopeptide	oxazolidone	anzamycin	tetracycline	glycopeptide
Pathogen Name	**Amikacin**	**Gentamicin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Tobramycin**	**Ampicillin/Sulbactam**	**Amoxicillin/Clavulanic Acid**	**Piperacillin/Tazobactam**	**Cefazolin**	**Cefepime**	**Cefotaxime**	**Cefoxitin**	**Ceftazidime**	**Ceftriaxone**	**Cefuroxime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Azithromycin**	**Erythromycin**	**Ampicillin**	**Oxacillin/Methicillin**	**Penicillin G**	**Trimethoprim/Sulfamethoxazole**	**Clindamycin**	**Daptomycin**	**Linezolid**	**Rifampin**	**Tetracycline**	**Vancomycin**
Gram-positive																																
Enterococcus faecium																																(10) **30%**
Enterococcus faecalis	(11) **82%**		(33) **55%**	(33) **67%**												(16) **50%**	(14) **57%**							(45) **98%**			(20) **80%**		(12) **100%**	(19) **95%**		(15) **7%**	(40) **95%**
Staphylococcus aureus		(108) **95%**				(15) **80%**	(10) **90%**		(10) **90%**			(20) **40%**				(52) **52%**	(82) **57%**	(35) **63%**					(134) **40%**		(153) **52%**	(11) **0%**	(127) **96%**	(128) **66%**	(45) **100%**	(74) **99%**	(20) **95%**	(123) **95%**	(133) **100%**
Staphylococcus epidermidis		(11) **64%**															(12) **25%**						(19) **21%**		(19) **11%**		(11) **27%**	(16) **31%**				(16) **75%**	(75) **99%**
Staphylococcus coagulase negative																																(11) **91%**
Gram-negative																																
Escherichia coli	(14) **100%**	(26) **81%**			(23) **87%**	(15) **60%**		(17) **94%**	(16) **88%**	(25) **88%**	(14) **100%**	(13) **85%**	(18) **89%**	(23) **87%**	(14) **86%**	(19) **79%**	(17) **65%**	(10) **90%**	(10) **100%**	(11) **100%**	(16) **100%**			(23) **39%**									
Enterobacter cloacae	(11) **100%**	(23) **91%**			(14) **100%**	(12) **17%**		(17) **82%**	(13) **23%**	(19) **89%**			(13) **62%**	(18) **67%**	(12) **17%**	(16) **88%**	(15) **93%**				(16) **100%**			(10) **10%**			(23) **74%**					(10) **90%**	
Klebsiella pneumoniae		(19) **95%**			(13) **100%**	(11) **82%**		(14) **79%**	(10) **80%**	(12) **92%**				(14) **93%**	(12) **100%**	(12) **92%**					(16) **94%**			(14) **14%**			(15) **100%**						
Pseudomonas aeruginosa		(17) **82%**			(17) **82%**			(13) **77%**		(14) **79%**			(14) **71%**			(16) **81%**	(16) **81%**			(11) **82%**	(11) **82%**	(10) **50%**								(110) **97%**		
Serratia marcescens		(12) **100%**			(10) **100%**					(10) **100%**				(12) **100%**			(10) **100%**									(11) **100%**						

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

2012 HAI Antibiogram, HSR 4/5N

	amino-glycosides		cephalosporins			quinolones			penicillins		carbapenems	macrolides	folate inhibitor	lincosamide	lipopeptide	oxazolidone	ansamycin	tetracycline	glyclycycline	glycopeptide
Pathogen Name	**Amikacin**	**Gentamicin**	**Cefepime**	**Cefoxitin**	**Ceftazidime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Ampicillin**	**Oxacillin/Methicillin**	**Imipenem**	**Erythromycin**	**Trimethoprim/Sulfamethoxazole**	**Clindamycin**	**Daptomycin**	**Linezolid**	**Rifampin**	**Tetracycline**	**Tigecycline**	**Vancomycin**
Gram-Positive																				
Enterococcus faecalis									(10) **100%**							(11) **100%**				(13) **100%**
Staphylococcus aureus		(50) **96%**		(12) **42%**		(32) **56%**	(40) **65%**	(28) **71%**		(56) **52%**		(49) **39%**	(43) **98%**	(50) **62%**	(13) **100%**	(38) **100%**	(44) **100%**	(48) **96%**	(10) **100%**	(49) **100%**
Staphylococcus epidermidis																				(10) **100%**
Gram-Negative																				
Pseudomonas aeruginosa	(10) **100%**	(12) **75%**	(10) **100%**		(12) **92%**	(13) **77%**					(12) **75%**									

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

2012 HAI Antibiogram, HSR 6/5S

	aminoglycosides					b-lactam/b-lactamase inhibitors			cephalosporins							quinolones			carbapenems			penicillins		macrolides		antifungals		folate inhibitor	lincosamide	lipopeptide	oxazolidone	ansamycin	tetracycline	glyclycycline	glycopeptide
Pathogen Name	**Amikacin**	**Gentamicin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Tobramycin**	**Ampicillin/Sulbactam**	**Amoxicillin/Clavulanic Acid**	**Piperacillin/Tazobactam**	**Cefazolin**	**Cefepime**	**Cefotaxime**	**Cefoxitin**	**Ceftazidime**	**Ceftriaxone**	**Cefuroxime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Ampicillin**	**Oxacillin/Methicillin**	**Azithromycin**	**Erythromycin**	**Caspofungin**	**Fluconazole**	**Trimethoprim/ Sulfamethoxazole**	**Clindamycin**	**Daptomycin**	**Linezolid**	**Rifampin**	**Tetracycline**	**Tigecycline**	**Vancomycin**
Fungi																																		
Candida albicans																									(20) **20%**	(10) **90%**								
Candida glabrata																									(18) **0%**	(10) **50%**								
Candida parapsilosis																									(11) **18%**									
Gram-Positive																																		
Enterococcus faecium			(13) **100%**																			(21) **5%**							(10) **100%**	(18) **100%**				(21) **10%**
Enterococcus faecalis			(28) **79%**	(21) **71%**																		(33) **91%**							(12) **100%**	(19) **95%**		(16) **31%**		(34) **88%**
Enterococcus spp.																						(18) **83%**								(10) **100%**				(18) **78%**
Staphylococcus aureus		(81) **91%**										(17) **65%**				(33) **48%**	(76) **57%**	(31) **71%**					(21) **29%**		(138) **43%**			(117) **97%**	(134) **62%**	(48) **100%**	(96) **100%**	(110) **99%**	(135) **94%**	(19) **84%**	(142) **100%**
Staphylococcus epidermidis																																		(29) **100%**
Staphylococcus coagulase negative																																		(42) **98%**
Gram-Negative																																		
Enterobacter aerogenes		(10) **100%**			(10) **100%**																													
Escherichia coli	(31) **97%**	(32) **78%**			(30) **73%**	(22) **55%**		(26) **92%**	(26) **65%**	(24) **83%**	(19) **84%**	(18) **83%**	(20) **85%**	(26) **85%**	(11) **64%**	(27) **70%**	(23) **70%**			(17) **100%**	(18) **100%**	(33) **42%**		(19) **84%**				(27) **56%**					(15) **60%**		
Enterobacter cloacae	(14) **93%**	(16) **88%**			(14) **93%**			(12) **92%**	(12) **8%**	(12) **100%**	(10) **60%**			(11) **64%**		(13) **100%**			(12) **92%**		(12) **100%**	(10) **0%**												
Klebsiella pneumoniae	(39) **95%**	(42) **90%**			(40) **83%**	(30) **53%**	(12) **50%**	(24) **67%**	(39) **64%**	(34) **71%**	(16) **81%**	(24) **83%**	(28) **64%**	(31) **74%**	(14) **43%**	(35) **83%**	(32) **75%**		(23) **91%**	(27) **96%**	(15) **93%**	(42) **0%**		(12) **83%**				(34) **79%**					(16) **38%**		
Pseudomonas aeruginosa	(41) **95%**	(43) **84%**			(43) **88%**			(37) **95%**		(40) **85%**			(38) **87%**			(39) **69%**	(33) **67%**			(27) **81%**	(28) **79%**			(22) **68%**										
Serratia marcescens	(15) **100%**	(16) **100%**			(15) **87%**	(11) **9%**		(13) **92%**	(15) **20%**	(12) **100%**	(11) **100%**		(13) **85%**	(12) **100%**		(14) **100%**	(13) **100%**			(10) **90%**		(13) **15%**						(12) **92%**							

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

2012 HAI Antibiogram, HSR 7

	aminoglycosides					b-lactam/b-lactamase inhibitors		cephalosporins					quinolones			penicillins		macrolides		carbapenem	folate inhibitor	lincosamide	lipopeptide	oxazolidone	ansamycin	tetracycline	glycopeptide
Pathogen Name	**Amikacin**	**Gentamicin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Tobramycin**	**Amoxicillin/Clavulanic Acid**	**Piperacillin/Tazobactam**	**Cefazolin**	**Cefepime**	**Cefoxitin**	**Ceftazidime**	**Ceftriaxone**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Ampicillin**	**Oxacillin/Methicillin**	**Azithromycin**	**Erythromycin**	**Imipenem**	**Trimethoprim/Sulfamethoxazole**	**Clindamycin**	**Daptomycin**	**Linezolid**	**Rifampin**	**Tetracycline**	**Vancomycin**
Gram-Positive																											
Enterococcus faecalis			(12) **75%**	(12) **92%**												(18) **94%**											(19) **95%**
Staphylococcus aureus		(50) **98%**				(10) **90%**				(20) **40%**			(20) **60%**	(34) **59%**	(13) **77%**		(78) **59%**		(68) **53%**		(66) **98%**	(65) **78%**	(12) **100%**	(26) **100%**	(26) **100%**	(65) **91%**	(66) **100%**
Staphylococcus epidermidis																											(31) **97%**
Gram-Negative																											
Escherichia coli										(13) **85%**	(18) **89%**																
Enterobacter cloacae											(13) **62%**																
Klebsiella pneumoniae		(12) **83%**			(12) **83%**		(10) **100%**	(12) **75%**				(10) **70%**	(12) **83%**			(12) **8%**					(12) **83%**						
Pseudomonas aeruginosa	(14) **100%**	(19) **95%**			(17) **94%**		(11) **100%**		(18) **100%**		(14) **71%**		(17) **88%**	(14) **71%**				(10) **90%**		(12) **92%**							

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

2012 HAI Antibiogram, HSR 8

	aminoglycosides			b-lactam/b-lactamase inhibitors			cephalosporins				quinolones			carba-penems		penicillins			macrolides		folate inhibitor	lincosamide	oxazolidone	ansamycin	tetracycline	glyclycycline	glycopeptide
Pathogen Name	**Amikacin**	**Gentamicin**	**Tobramycin**	**Ampicillin/Sulbactam**	**Amoxicillin/Clavulanic Acid**	**Piperacillin/Tazobactam**	**Cefazolin**	**Cefepime**	**Cefoxitin**	**Ceftriaxone**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Imipenem**	**Meropenem**	**Ampicillin**	**Oxacillin/Methicillin**	**Penicillin G**	**Azithromycin**	**Erythromycin**	**Trimethoprim/Sulfamethoxazole**	**Clindamycin**	**Linezolid**	**Rifampin**	**Tetracycline**	**Tigecycline**	**Vancomycin**
Gram-Positive																											
Enterococcus faecalis																(11) **91%**											(14) **93%**
Staphylococcus aureus		(60) **95%**									(27) **74%**	(30) **73%**	(14) **64%**				(94) **61%**	(18) **6%**		(92) **52%**	(83) **100%**	(92) **68%**	(23) **100%**	(27) **100%**	(37) **97%**	(31) **100%**	(85) **100%**
Staphylococcus epidermidis		(14) **50%**															(13) **15%**			(14) **36%**		(15) **40%**					(19) **100%**
Gram-Negative																											
Escherichia coli	(13) **92%**	(23) **87%**	(14) **86%**	(15) **60%**	(12) **67%**	(16) **94%**	(22) **59%**	(18) **89%**	(13) **85%**	(22) **86%**	(17) **65%**	(14) **71%**		(10) **100%**		(19) **26%**			(10) **90%**		(20) **60%**						
Enterobacter cloacae								(10) **100%**		(14) **86%**																	
Klebsiella pneumoniae		(16) **100%**					(15) **87%**	(15) **93%**			(16) **94%**				(10) **90%**	(16) **0%**			(10) **80%**		(15) **80%**						
Pseudomonas aeruginosa		(17) **76%**	(11) **73%**			(16) **88%**		(16) **81%**			(18) **67%**				(15) **73%**												

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

2012 HAI Antibiogram, HSR 9/10

	quinolones		lincosamide	macrolide	aminoglycoside	oxazolidone	penicillin	ansamycin	Tetracycline	folate inhibitor	glycopeptide
Pathogen Name	**Ciprofloxacin**	**Levofloxacin**	**Clindamycin**	**Erythromycin**	**Gentamicin**	**Linezolid**	**Oxacillin/Methicillin**	**Rifampin**	**Tetracycline**	**Trimethoprim/ Sulfamethoxazole**	**Vancomycin**
Gram-Positive											
Staphylococcus aureus	(17) **76%**	(13) **77%**	(16) **81%**	(18) **67%**	(18) **100%**	(17) **100%**	(21) **81%**	(18) **100%**	(18) **94%**	(17) **100%**	(18) **100%**
Staphylococcus epidermidis											(10) **100%**

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

2012 HAI Antibiogram, HSR 11

	aminoglycosides			b-lactam/b-lactamase inhibitors		cephalo-sporins		quino-lones		penicillins		lincosamide	macrolide	ansamycin	Tetracycline	folate inhibitor	glycopeptide
Pathogen Name	**Gentamicin**	**Gentamicin-High Level Test**	**Tobramycin**	**Ampicillin/Sulbactam**	**Piperacillin/ Tazobactam**	**Cefazolin**	**Ceftriaxone**	**Ciprofloxacin**	**Levofloxacin**	**Ampicillin**	**Oxacillin/Methicillin**	**Clindamycin**	**Erythromycin**	**Rifampin**	**Tetracycline**	**Trimethoprim/ Sulfamethoxazole**	**Vancomycin**
Gram-Positive																	
Enterococcus faecalis		(13) **54%**								(14) **100%**							(16) **100%**
Staphylococcus aureus	(26) **88%**							(11) **55%**	(16) **63%**		(41) **51%**	(36) **61%**	(38) **34%**	(25) **96%**	(35) **83%**	(32) **94%**	(38) **100%**
Staphylococcus epidermidis																	(26) **96%**
Gram-Negative																	
Klebsiella pneumoniae	(14) **100%**			(11) **100%**		(11) **100%**	(11) **91%**		(11) **100%**	(13) **15%**						(11) **73%**	
Pseudomonas aeruginosa			(11) **82%**		(11) **100%**			(11) **73%**									

Note: Pathogens with less than 10 isolates and antibiotics with less than 25 isolates were excluded from this antibiogram. The number in parentheses indicates the total number of isolates and the percent susceptible is shown in bold).

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